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SECTION: ARTICLE: REASONABLE AND NONDISCRIMINATORY (RAND) ROYALTIES, STANDARDS SELECTION, AND CONTROL OF MARKET POWER

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TEXT:

Two sets of rules are critical for the long-run prospects of the economy: those for the use and dissemination of intellectual property (IP) and those for the establishment of standards promoting the compatibility of products embodying such IP. This article is concerned with issues that arise at the intersection of these sets of rules, particularly those dealing with the effects on competition of the adoption by standard-setting organizations (SSOs) of interface and other compatibility standards in which private parties own intellectual property rights. We focus especially on reasonable and nondiscriminatory (RAND) licensing commitments that SSOs may impose or solicit in the course of standard setting to avoid conferring market power on private IP holders. We evaluate these practices in relation to economic theory and the policies of the antitrust and intellectual property laws.

From the point of view of the general welfare, any system of rules affecting innovative intellectual property is beset by an inherent tension between (1) providing effective incentives for investment of labor and other valuable resources in the difficult, expensive, and risky activities required for innovation, and (2) facilitating and encouraging rapid dissemination and adoption of new products and processes to replace obsolete ones. It may well be thought that success

in the latter generally can be achieved only at the expense of the former, and vice versa. The more quickly and inexpensively inventions are available for use by all suppliers to a market, the smaller the reward that the possessor of the entailed intellectual property apparently can hope to obtain.

This conflict was once thought a characteristic of the relationship between the IP and antitrust laws themselves: the "patent and antitrust laws necessarily clash." n1 Modern antitrust doctrine, however, views the two legal regimes as sharing "the common purpose of promoting innovation and enhancing consumer welfare," n2 functioning as complementary instruments that work in tandem to strike the socially optimal balance between rewarding innovation and promoting the diffusion of new technology.

n1 *SCM Corp. v. Xerox Corp.*, 645 F.2d 1195, 1203 (2d Cir. 1981) ("While the antitrust laws proscribe unreasonable restraints of competition, the patent laws reward the inventor with a temporary monopoly that insulates him from competitive exploitation of his patented art."); *see also United States v. Westinghouse Elec. Corp.*, 648 F.2d 642, 646 (9th Cir. 1981) ("There is an obvious tension between the patent laws and antitrust laws. One body of law creates and protects monopoly power while the other seeks to proscribe it.").

n2 *See* U.S. Dep't of Justice & Federal Trade Comm'n, Antitrust Guidelines for the Licensing of Intellectual Property § 1.0 (1995), available at <http://www.usdoj.gov/atr/public/guidelines/0558.pdf> [hereinafter DOJ-FTC Intellectual Property Guidelines]. Courts have cautioned that antitrust enforcement should be careful not to "chill" or "stifle" innovative activity. *See, e.g., Berkey Photo Inc. v. Eastman Kodak Co.*, 603 F.2d 263, 282-83 (2d Cir. 1979).

The intellectual property laws pursue this common purpose by conferring certain legal rights to exclude others, thereby "helping the owners to profit from the use of their property." n3 Doing so provides arguably suitable incentives for the innovation process. n4 "In the absence of [these] rights, imitators could more rapidly exploit the efforts of innovators and investors without compensation. Rapid imitation would reduce the commercial value of innovation and erode incentives to invest, ultimately to the detriment of consumers." n5

n3 *See* DOJ-FTC Intellectual Property Guidelines, *supra* note 2, § 2.1.

n4 *See, e.g.,* Kenneth W. Dam, *The Economic Underpinnings of Patent Law*, 23 *J. LEGAL STUD.* 247 (1994); RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* § 3.3 (5th ed. 1998). It has been observed that one purpose of the patent system is to promote the availability of information on intellectual property and that the disclosure rules that are applied under patent law are the instruments used to promote this objective. That, however, is surely not the only purpose of the patent system.

n5 *See* DOJ-FTC Intellectual Property Guidelines, *supra* note 2, § 1.0.

As a practical matter, these rights typically result in prices that are elevated for a limited time compared to those that would be observed in the absence of IP protections. If the patent and copyright laws are appropriately designed, as will be assumed throughout this article, then this difference in price levels provides a surplus that constitutes a socially optimal incentive for investment in innovative activity that is properly balanced against the goal of rapid diffusion of technology. n6 To avoid disturbing this balance, antitrust law must avoid penalizing conduct that is reasonably consistent with the enjoyment of such incentives, while preventing acts (otherwise within the reach of antitrust, of course) that have the effect of materially increasing or reducing them. This is no easy task in the simplest of circumstances and is particularly challenging in the context of the standard-setting activities that take place on a daily basis under the auspices of scores of SSOs around the world.

n6 For the view that the patent laws are not optimally designed or implemented, see ADAM B. JAFFE &

JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT (2004).

Several fundamental attributes of the standard-setting process are critical to a proper understanding of the complicated environment in which antitrust must operate:

(1) *Compatibility and IP Rights*. Ensuring that products and devices work efficiently in tandem is a major objective of SSOs.ⁿ⁷ Sometimes it is simple for an SSO to set standards that ensure compatibility. For example, electric sockets are easily designed so as to enable them to work with electric bulbs from many different suppliers. But in more sophisticated products, as for example in computers, software, telecommunications, consumer electronics, and the Internet, there can be dozens of complex compatibility specifications, requiring extensive discussion and consultation, before one can arrive at a set of standards to which the affected firms are prepared to adhere. Moreover, technical change can require evolving standards. And compatibility is important for many reasons, not just to permit the different elements of the pertinent products to work together.

ⁿ⁷ For an excellent survey of SSOs and standard-setting activities, see Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CAL. L. REV. 1889 (2002).

(2) *Standard Setting and Market Power*. Another consideration, important for the current discussion, is that standards and associated technical specifications can facilitate entry and competition by promoting substitutability and interoperability of products and processes and by intensifying "intra-standard" rivalry. Such objectives are often viewed as sufficiently compelling to justify SSOs setting standards that require access to proprietary intellectual property rights. On the other hand, while there is no presumption that control of such IP rights automatically or necessarily bestows market or monopoly power on their owners, adopting standards that depend on private IP rights carries the risk of creating a degree of market power that distorts competition and generates returns in excess of those contemplated by the IP laws.

(3) *Network Externalities Entailed by Standardized IP*. The risk of creating market power through standardization is increased where network externalities prevail. IP is a source of such externalities when the value of access to the IP or of final products relying on the IP increases with the number of users of the technology or its final product. This can give rise to market power in the market for the IP. In addition, where the IP owner is also a producer of the final product, network externalities may allow the proprietor of the IP to exercise market power in the downstream product market. The firm that achieves large sales volume first may, at least for a time, be relatively insulated from competition. This may happen even though that firm is not prospectively the most efficient supplier or its final product is somewhat inferior to that of the holders of substitute intellectual property.

(4) *IP as Downstream Input*. Intellectual property usually is not offered for sale to consumers as a final product. It is more often an *input* to creation or improvement of the final products. When prospective or current rivals of the owner of the intellectual property in the downstream markets for the IP's final product lack access to such inputs, they may not be able to survive. In short, the IP may (but does not necessarily) constitute what is sometimes described as an "essential" input for downstream competition.

In light of these attributes, there is the risk that the standard-setting process may itself be utilized to confer market or monopoly power beyond that contemplated by the intellectual property laws, which, in turn, may distort competition, impede technological dissemination and yield returns to innovation that are *too high*. As Lemley and McGowan frame the overall issue, "the general danger of allowing a private party to own intellectual property rights in an open standard is that the private party may at some point attempt to [distort competition], either by licensing it on discriminatory terms, by setting an unreasonable price for continued access, or simply by denying access (a license) altogether."ⁿ⁸

ⁿ⁸ Mark A. Lemley & David McGowan, *Could Java Change Everything? The Competitive Propriety of a*

Proprietary Standard, 43 ANTITRUST BULL. 715, 760 (1998).

Such concerns will be magnified if the IP owner is also a participant in the downstream market, as when the proprietor of an important patent also manufactures electronic devices using that patent. In such cases, license terms may impede or exclude competition in that final-product market. Indeed, a complex standard can be entangled in a "patent thicket," a set of patents owned by different industry participants, each of which can be used to attempt to block others from providing products that meet the adopted standard.ⁿ⁹ A complex piece of equipment, such as a computer, characteristically is made up of components each of which is covered by patents, and the patents pertinent for such an item are usually owned by a number of different firms, many of them direct competitors in the final-product market.ⁿ¹⁰ Many firms each may be able to bring the manufacturing process of others to a halt. Furthermore, a firm that holds such a blocking patent may be tempted not to reveal this to the other members of an SSO before standards have been agreed upon, in hope that they will be misled to select a standard that this firm will subsequently be able to control and perhaps "hold up" the others for excessive payments.ⁿ¹¹

ⁿ⁹ See Peter N. Detkin, A Semiconductor Patent Survey, Statement at the FTC/DOJ Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy (Feb. 28, 2002) (Power Point slideshow available at <http://www.ftc.gov/opp/intellect/020228peterndetkin.pdf>) (estimate by executive of world's largest semiconductor company that there were more than 90,000 patents generally related to microprocessors held by more than 10,000 parties in 2002); see generally Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in 1 INNOVATION POLICY AND THE ECONOMY 119 (Adam B. Jaffe, Josh Lerner & Scott Stern eds., 2002); but see Ronald J. Mann, The Myth of the Software Patent Thicket: An Empirical Investigation of the Relationship Between Intellectual Property and Innovation in Software Firms (Univ. of Tex. Sch. of Law, Law and Economics Working Paper No. 022, Feb. 2004).

ⁿ¹⁰ See FEDERAL TRADE COMM'N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY ch. III(IV) (2003) [hereinafter FTC PATENT REPORT].

ⁿ¹¹ We address the general issue of IP non-disclosure in Part V below.

Mindful of the risk that standard selection may create market power, SSOs commonly require that IP holders commit in advance to license their IP on reasonable and nondiscriminatory or "RAND" terms as a condition of participation in the standard-setting process.ⁿ¹² Of course, a RAND commitment is of limited value in the absence of objective benchmarks that make clear the concrete terms or range of terms that are deemed to be reasonable and nondiscriminatory. It is widely acknowledged that, in fact, there are no generally agreed tests to determine whether a particular license does or does not satisfy a RAND commitment.ⁿ¹³ This situation has spurred debate, contention, and even public and private litigation. Indeed, it has been said that "litigation over 'fair,' 'reasonable,' 'nondiscriminatory' license terms is unusually long and protracted, imposing significant costs on patent owners and SSO members engaged in these disputes."ⁿ¹⁴ As we explain in this article, however, objective models do exist for evaluating RAND compliance in a manner fully consistent with the policies of both the antitrust and IP laws.

ⁿ¹² Lemley, *supra* note 7, at 1906; Mark R. Patterson, *Inventions, Industry Standards, and Intellectual Property*, 17 BERKELEY TECH. L.J. 1043, 1053-54 (2002); Scott K. Peterson, Patents and Standard-Setting Processes, Statement at the FTC/DOJ Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy (Apr. 18, 2002), available at <http://www.ftc.gov/opp/intellect/020418scottkpeterson.pdf>.

ⁿ¹³ See, e.g., R. Hewitt Pate, Ass't Att'y Gen., Antitrust Div'n, U.S. Dep't of Justice, Competition and Intellectual Property in the U.S.: Licensing Freedom and the Limits of Antitrust, Speech at 2005 EU Competition Workshop (June 3, 2005), available at <http://www.usdoj.gov/atr/public/speeches/209359.htm> ("A

difficulty of RAND . . . is that the parties tend to disagree later about what level of royalty rate is 'reasonable.'"); Lemley, *supra* note 7, at 1905-06, 1964-65; Patterson, *supra* note 12, at 1053 (noting that "the definition of 'reasonable' [as used in RAND] is not so clear" and that "standard-setting bodies themselves make little effort to define the term").

n14 Patrick D. Curran, *Standard-Setting Organizations: Patents, Price Fixing, and Per Se Illegality*, 70 U. CHI. L. REV. 983, 993 (2003).

Part I of this article reviews how selection of a standard can confer market power on the owner of proprietary intellectual property, even when standard selection occurs in an environment where many contending technologies are on offer. This is particularly likely in markets characterized by network externalities. The article next undertakes to develop interpretations of the RAND commitment that are consistent with antitrust and intellectual property law. Given that those laws do not generally affirmatively limit royalties charged by IP holders to levels consistent with *ex ante* (rather than *ex post*) market power, Part II identifies an auction-like model for private control of market power that provides a basis (and conceptual criteria) for confirming that particular royalties are "reasonable" (the "R" in RAND). Part III proposes a formula for royalties that are "nondiscriminatory" (the "ND" in RAND). This formula is based on the principle of the "efficient component pricing rule" (ECPR), which is shown to be both necessary and sufficient for a license fee to be competitively neutral in downstream markets. It is, therefore, at least on that basis, a necessary condition for the fee to be nondiscriminatory.

Part IV shows that RAND royalties, interpreted on the basis set forth in Parts II and III, provide suitable incentives for voluntary licensing, and provide benefits to both the licensor and the licensee. This is accomplished by offering *the licensee* all of that portion of the total profits that is made possible by any superiority in its efficiency in utilization of the IP in question, and by ensuring *the licensor* at least as much profit as it could obtain through refusal to license. Part V addresses the issue of disclosure of intellectual property rights in standard-setting exercises, highlighting the tension that exists in designing SSO disclosure policies between promoting the legitimate interests of standard setting and preserving competitive incentives for innovation. We also analyze the relationship between nondisclosure by participants in a standard-setting process and RAND licensing obligations, and propose that the appropriate RAND royalty for an intentionally undisclosed IP right should be the incremental cost of licensing.

I. MARKET POWER BEFORE AND AFTER STANDARD SELECTION

The patent and copyright systems give the possessor of IP a grant of what is sometimes referred to as a "temporary monopoly," although this loose terminology can be misleading. n15 It is by now largely agreed that the mere possession of a patent, copyright, or other intellectual property right does not in itself warrant any presumption of market or monopoly power and that the power (if any) conferred by an intellectual property right is a function of the availability of substitutable technology or products. n16 As a practical matter, market power in technology markets is often measured by reference to the size of the set of alternative technologies that can be substituted for one another at comparable user costs. n17 A market with two, three, or four alternative types of technology may be reasonably competitive (and a market with five may be eligible for inclusion in the antitrust "safety zone" prescribed by the DOJ-FTC Intellectual Property Guidelines). n18

n15 See, e.g., *Berkey Photo, Inc. v. Eastman Kodak Co.*, 603 F.2d 263, 291 n.49 (2d Cir. 1979) ("Kodak held a temporary monopoly in C-41 processing and equipment only in the sense that every firm initially possesses a 100% market share in its own innovations and the peripheral products and services associated with it."); *SCM Corp. v. Xerox Corp.*, 645 F.2d 1195, 1203 (2d Cir. 1981) ("The patent laws reward the inventor with a temporary monopoly that insulates him from competitive exploitation of his patented art. When the patented product, as is often the case, represents merely one of many products that effectively compete in a given product market, few antitrust problems arise."); DOJ-FTC Intellectual Property Guidelines, *supra* note 2, § 2.2; Jaffe & Lerner, *supra* note 6, at 7 ("A patent . . . creates a kind of monopoly for its owner, although the breadth and

hence significance of this monopoly depends on the breadth or extent of the patent grant.").

n16 See DOJ-FTC Intellectual Property Guidelines, *supra* note 2, § 2.2; *Jefferson Parish Hosp. Dist. No. 2 v. Hyde*, 466 U.S. 2, 37 n.7 (1984) (O'Connor, J., concurring); *Unitherm Food Sys., Inc. v. Swift-Eckrich, Inc.*, 375 F.3d 1341, 1363-66 (Fed. Cir. 2004), *cert. granted in part*, 125 S. Ct. 1396, *cert. denied*, 125 S. Ct. 1399 (2005); *In re Independent Serv. Orgs. Antitrust Litig.*, 203 F.3d 1322, 1325-26 (Fed. Cir. 2000); *C.R. Bard, Inc. v. M3 Sys., Inc.*, 157 F.3d 1340, 1368 (Fed. Cir. 1998); *Town Sound & Custom Tops, Inc. v. Chrysler Motors Corp.*, 959 F.2d 468, 479-80 (3d Cir. 1992); *Abbott Labs. v. Brennan*, 952 F.2d 1346, 1354-55 (Fed. Cir. 1991). *But see Independent Ink, Inc. v. Illinois Tool Works, Inc.*, 396 F.3d 1342 (Fed. Cir. 2005) (holding that a rebuttable presumption of market power in patent tying cases is mandated by Supreme Court precedent), *cert. granted*, 125 S. Ct. 2937 (2005).

n17 See HERBERT HOVENKAMP, MARK D. JANIS & MARK A. LEMLEY, IP AND ANTITRUST: AN ANALYSIS OF ANTITRUST PRINCIPLES APPLIED TO INTELLECTUAL PROPERTY LAW § 4.1c at 4-7 & § 4.3c1 at 4-48 (2003). Of course, there may be no market power in the technology market even if the alternative technology set is small, if there is vigorous rivalry from substitute goods in the market for the final product than makes use of the technology. See DOJ-FTC Intellectual Property Guidelines, *supra* note 2, § 3.2.2.

n18 See DOJ-FTC Intellectual Property Guidelines, *supra* note 2, § 4.3.

Standard-setting exercises normally arise only when there are technological alternatives to select among, and so, almost by definition, are likely to occur in competitive--perhaps very competitive--technology markets. Even when conditions are competitive before the selection of a standard, however, the act of selection may lead to increased *ex post* market power for owners of the IP necessary to practice the winning standard.

Selection as a proprietary standard may affect relative beliefs about quality, leaving at least some (and perhaps many) market participants to view alternative technologies as less close substitutes for the designated technology. Standard-setting activities often involve testing and comparative evaluation of competing technologies. n19 Victory in such a process--at least one whose outcome has not been skewed by noticeably biased procedures--bestows credibility and is likely to convey favorable information to the market about the quality of the technology in question or unfavorable information about the relative quality of alternative candidates.

n19 Access to the detailed results of such analyses may be limited to those who have entered into non-disclosure agreements.

Selection also can affect market expectations about future commercial success, which can be particularly significant when standard setting occurs in network markets. Much has been written about network effects and the phenomena of path dependence, critical mass, and tipping in network markets. n20 In such markets, demand is strongly influenced by buyers' forecasts of future sales and the ultimate size of the network because the value of the product increases as the number of users grows. n21 Actions that can lead to improved expectations, such as the endorsement of some technology by a standard-setting body, can yield large--even decisive--benefits in the marketplace. "In these circumstances, victory need not go to the better or cheaper product: an inferior product may be able to defeat a superior one if it is widely expected to do so." n22 Regardless of whether the selected standard is the best or the cheapest, the point for present purposes is that the effectiveness of the competitive constraints on the winning technology before selection can be undermined after selection if network effects are strong. n23

n20 See, e.g., LUIS M.B. CABRAL, INTRODUCTION TO INDUSTRIAL ORGANIZATION 311--34 (2000); OZ SHY, INDUSTRIAL ORGANIZATION: THEORY AND APPLICATIONS 253-77 (1995); Stanley M. Besen & Joseph Farrell, *Choosing How to Compete: Strategies and Tactics in Standardization*, 8 J. ECON. PERSP. 117 (1994); Michael L. Katz & Carl Shapiro, *Technology Adoption in the Presence of Network*

Externalities, 94 J. POL. ECON. 822 (1986); Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 AM. ECON. REV. 424 (1985).

n21 See, e.g., CABRAL, *supra* note 20, at 312-14; CARL SHAPIRO & HAL VARIAN, INFORMATION RULES; A STRATEGIC GUIDE TO THE NETWORK ECONOMY 230 (1999) ("We have stressed the importance of expectations as a driver of positive feedback in network markets: confidence breeds success, while doubt spells doom."); Besen & Farrell, *Choosing How to Compete*, *supra* note 20, at 118 ("expectations about the ultimate size of the network are crucial").

n22 Besen & Farrell, *supra* note 20, at 118.

n23 It should be noted that where the proprietary technology is not coextensive with the standard, as when it is only one among several inputs into the production of a standardized product or process, it is possible for network effects to arise in the relevant "goods" market without also affecting the relevant technology market. Network effects can arise in technology markets for a variety of reasons, of course--e.g., more licensees for a given technology means an increased prospect of improvements, stronger incentives for the creation of complementary technology, etc. In some cases, network effects can be so strong that technology alternatives to the one selected as the standard may not remain viable.

Finally, selection of a proprietary technology as a standard can reduce *ex post* competitiveness in the relevant technology market because licensees (or prospective licensees) incur durable investments tailored to the selected standard that give rise to non-negligible switching costs. n24 Such investments can take many forms. n25 The choice of technology may stimulate specialized investments in learning the techniques involved and digesting ongoing improvements. n26 Use of the technology may require investments in particular types of plant and equipment. Costly marketing campaigns may be undertaken to create buyer awareness of the use or incorporation of the proprietary technology. Sunk investments like these can give rise to high switching costs that create substantial obstacles to the use of alternative technologies and lead to "lock-in." n27

n24 See, e.g., SHAPIRO & VARIAN, *supra* note 21, at 103-71. Technology-specific investments, of course, may also be carried out before the selection of the standard.

n25 Of course, when standardization promotes compatibility with complementary products, it serves to that extent to reduce switching costs (by minimizing the extent to which investments in complementary products are lost when switching suppliers). See, e.g., Joseph Kattan, *Market Power in the Presence of an Installed Base*, 62 ANTITRUST L.J. 1 (1993).

n26 Exposure to alternative technology may be made "off limits" to the technical personnel involved because of licensor concerns about protection of know-how and other trade secrets.

n27 The term "lock-in" is also used to refer to the phenomenon of a network market tipping to one product as the result of the demand-side externalities of scale (i.e., network effects) discussed above. See, e.g., CABRAL, *supra* note 20, at 315. In the perhaps unlikely case where the technology adopted as standard is licensed on terms allowing licensees an unfettered right to sublicense to third parties (without paying additional compensation to the original licensor), intra-standard competition may substantially reduce the leeway for lock-in to arise. See, e.g., Kattan, *supra* note 25, at 12 ("the lock-in effect is of little competitive consequence when consumers are 'locked into' a competitive market").

In sum, an SSO's endorsement of a proprietary technology as a standard may have economic effects that convert a previously competitive technology market into one that is subject *ex post* to market or monopoly power. n28 Standard selection may thus create or enhance market power in the market for technology licensing. Power in the market for technology will not necessarily be leveraged downstream, but there is at least the possibility that it will be exercised to

harm competition in markets for standard-compliant products and services, particularly when such markets themselves are characterized by network effects. n29 Of course, the facts of any given case of standard setting must be analyzed individually as it is entirely possible that after selection, alternative technologies (or even alternative standards) may remain viable substitutes for the standardized technology. n30

n28 For the moment, no distinction is drawn between "traditional" market power and the power to exploit individual licensees that arises after the licensees are locked-in by their relationship-specific investments.

n29 *See, e.g.,* ABA SECTION OF ANTITRUST LAW, HANDBOOK ON THE ANTITRUST ASPECTS OF STANDARDS SETTING 99-106 (2004); KNUT BLIND, THE ECONOMICS OF STANDARDS: THEORY, EVIDENCE, POLICY 43-44 (2004); Dennis W. Carlton, *A General Analysis of Exclusionary Conduct and Refusal to Deal--Why Aspen and Kodak Are Misguided*, 68 *ANTITRUST L.J.* 659, 661-71 (2001); Louis Kaplow, *Extension of Monopoly Power Through Leverage*, 85 *COLUM. L. REV.* 515, 520-39 (1985).

n30 *See, e.g.,* Carl Shapiro, *Setting Compatibility Standards: Cooperation or Collusion?* (2000) (unpublished manuscript, available at <http://haas.berkeley.edu/shapiro/standards.pdf>); SHY, *supra* note 20, at 259-61.

When *ex post* market power is a realistic threat, however, one would expect participants in the standard-setting process (other than self-interested IP holders) to have a strong interest in limiting or preventing the creation and exercise of such power. In the remainder of this article, we discuss and analyze measures that are available to SSOs in order to achieve this very purpose. In particular, we turn next to examining the solicitation of commitments to license intellectual property on reasonable and nondiscriminatory (RAND) terms.

II. "REASONABLE" ROYALTIES IN THE STANDARD-SETTING CONTEXT: APPLICATION OF THE *EX ANTE* AUCTION MODEL

A. REASONABLE ROYALTIES AND THE LAW

If the primary goal of obtaining RAND licensing commitments is to prevent IP holders from setting royalties that exercise market power created by standardization, then the concept of a "reasonable" royalty for purposes of RAND licensing must be defined and implemented by reference to *ex ante* competition, i.e., competition in advance of standard selection. Economists have readily embraced this approach, n31 but it does not flow naturally or automatically from the antitrust or patent (or other IP) laws. Neither the antitrust nor the patent laws deem it unreasonable for IP holders to seek to reap the returns that accrue *ex post* from the attainment of lawfully won monopoly or market power. n32 A patent owner is generally entitled under patent law to extract as high a royalty as it can obtain. n33 Antitrust law similarly does not forbid a firm, acting unilaterally, from making use of lawfully obtained monopoly power to negotiate a supracompetitive royalty. That is, as a general matter, Section 2 of the Sherman Act is not violated when a single firm engages in conduct directed at reaping profits from its customers without injuring the process of competition (though sometimes such acts may be remediable by tort or contract law). n34 Thus, the courts have generally rejected the notion that it is an antitrust offense for a monopolist to charge a monopoly price, without more. n35 As Judge Posner has put it, "the antitrust laws are not a price-control statute or a public utility or common-carrier rate-regulation statute." n36 To the contrary, as the Supreme Court has recently explained, "the opportunity to charge monopoly prices--at least for a short period--is what attracts 'business acumen' in the first place; it induces risk taking that produces innovation and economic growth." n37

n31 *See, e.g.,* SHAPIRO & VARIAN, *supra* note 21, at 241 (reasonable royalties are "the royalties that the patent-holder could obtain in open, up-front competition with other technologies, not the royalties that the patent holder can extract once other participants are effectively locked in to use technology covered by the patent"); Joseph Farrell & Carl Shapiro, *Intellectual Property, Competition, and Information Technology* 30 (Univ. of

Cal., Berkeley Competition Policy Center, Working Paper No. CPC04-45, March 2004) (fair and reasonable licensing terms are "normally best measured by adopters' willingness to pay . . . when they know their alternatives and have not yet made investments specific to that technology").

n32 In this section, we assume that the IP holder is not in competition with its customers. We address the case of discriminatory royalties charged to customer-competitors in Part IV below.

n33 See, e.g., *Brulotte v. Thys Co.*, 379 U.S. 29, 33 (1964) ("A patent empowers the owner to exact royalties as high as he can negotiate with the leverage of that monopoly."); *W.L. Gore & Assocs. v. Carlisle Corp.*, 529 F.2d 614, 623 (3d Cir. 1976) ("The general rule is that, absent any overriding unlawful conduct, 'A patent empowers the owner to exact royalties as high as he can negotiate with the leverage of that monopoly.' A royalty demand which is so high as to preclude acceptance of a license offer is, after all, not appreciably different from a refusal to license upon any terms. The right to refuse to license is the essence of the patent holder's right under the patent law which rewards invention disclosure by the grant of a limited monopoly in the exploitation of the invention.") (citations omitted). In the case of infringement, a court must award the patent holder "in no event less than a reasonable royalty," 35 U.S.C. § 284, which is defined by patent law as the amount a willing licensor and licensee would have agreed to had they negotiated a license the day the infringement commenced. See, e.g., *Trans-World Mfg. Corp. v. Al Nyman & Sons, Inc.*, 750 F.2d 1552, 1568 (Fed. Cir. 1984); *Panduit Corp. v. Stahlin Bros. Fibre Works*, 575 F.2d 1152, 1157-58 (6th Cir. 1978). But see Patterson, *supra* note 12 (proposing approach under patent laws distinguishing between demand for a given invention and demand for an associated standard, allocating to the patentee only that remuneration attributable to its own innovative contribution).

n34 See, e.g., *Intergraph Corp. v. Intel Corp.*, 195 F.3d 1346, 1356-60 (Fed. Cir. 1999) (withdrawal of special customer benefits from non-competing customer was not an antitrust violation); *Berkey Photo, Inc. v. Eastman Kodak Co.*, 603 F.2d 263, 294 (2d Cir. 1979) ("If a firm has taken no action to destroy competition it may be unfair to deprive it of the ordinary opportunity to set prices at a profit-maximizing level."); *Alaska Air v. United Airlines*, 948 F.2d 536, 548-49 (9th Cir. 1991) ("Monopoly leveraging is just one of a number of ways that a monopolist can permissibly benefit from its position. This does not mean, however, that such conduct is anticompetitive. Both 'monopoly leveraging' in an adjacent market, and setting high prices in the original 'monopoly' market, represent the cost that we incur when we permit efficient and natural monopolies. The Supreme Court has consistently held that there must be 'predatory' conduct to attain or perpetuate a monopoly for a monopolist to be liable under Section 2.") (citations omitted); *Mr. Furniture Warehouse, Inc. v. Barclays American/Commercial Inc.*, 919 F.2d 1517, 1522 (11th Cir. 1990) ("to constitute a violation the monopolist's activities must tend to cause harm to competition; unrelated harm to an individual competitor or consumer is not sufficient"); Pate, *supra* note 13 ("Bringing a complaint to the Antitrust Division about 'excessive' royalties, without more, is a losing strategy. Antitrust enforcers are not in the business of price control. We protect a competitive process, not a particular result, and particularly not a specific price. In fact, if a monopoly is lawfully obtained, whether derived from IP rights or otherwise, we do not even object to setting a monopoly price.").

n35 See, e.g., *Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 407 (2004) ("The mere possession of monopoly power, and the concomitant charging of monopoly prices, is not only not unlawful; it is an important element of the free-market system."); *Arroyo-Melecio v. Puerto Rican Am. Ins. Co.*, 398 F.3d 56, 69 (1st Cir. 2005) ("A monopolist 'is free to exploit whatever market power it may possess when that exploitation takes the form of charging uncompetitive prices.'") (internal quotations and citation omitted); *Blue Cross & Blue Shield United v. Marshfield Clinic*, 65 F.3d 1406, 1412-13 (7th Cir. 1995) ("A natural monopolist that acquired and maintained its monopoly without excluding competitors by improper means is not guilty of 'monopolizing' in violation of the Sherman Act, and can therefore charge any price that it wants. . . .") (citation omitted); *Berkey Photo*, 603 F.2d at 294 ("setting a high price may be a use of monopoly power, but it is not in itself anticompetitive"); *Alaska Air*, 948 F.2d at 548-49 (same); *In re Tamoxifen Antitrust Litig.*, 277 F. Supp. 2d 121, 136-37 (E.D.N.Y. 2003) (no antitrust injury arises from unilateral refusal to license a

patent other than at supracompetitive prices).

n36 *Blue Cross*, 65 F.3d at 1413.

n37 *Trinko*, 540 U.S. at 407 (2004) ("To safeguard the incentive to innovate, the possession of monopoly power will not be found unlawful unless it is accompanied by an element of anticompetitive *conduct*.").

If antitrust and IP law do not generally supply a basis for limiting royalties charged by IP holders to levels consistent with *ex ante* (rather than *ex post*) market power, then private methods of control must be relied on to attempt to achieve this goal. Of course, private control itself may pose serious antitrust issues. The standardization process typically involves consultation and agreements among firms that are often competing buyers of IP and also may be competing sellers in the downstream product markets. While joint decision making by competitors can sometimes promote the general welfare, it always entails the danger of misbehavior for anticompetitive purposes, such as the threat of behavior aimed at collusively *reducing* the price paid for intellectual property. n38 Careful attention must be paid to the risk that the policies and practices adopted by SSOs and the actions taken by participating members in the course of the standard-setting process may yield rewards for innovation that are too low by comparison to the level of incentives normally entailed by the intellectual property laws and accepted by the antitrust laws.

n38 For a comprehensive discussion of antitrust issues arising in the context of private standard-setting activities, see HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 35; ABA SECTION OF ANTITRUST LAW, HANDBOOK ON THE ANTITRUST ASPECTS OF STANDARDS SETTING (2004).

Such considerations rule out defining a reasonable RAND royalty as the royalty that would be observed in the event that the prospective licensees were to band together (either before or after standard selection) and act as a buyers' cartel. The antitrust laws deem collusive conduct by buyers directed at reducing prices through the exercise of monopsony power to be a violation of the per se rule against price fixing. n39 Not all collaborations among potential licensees that touch on royalty determination are necessarily barred under the antitrust laws, however. As a general matter, the antitrust agencies recognize that many buying and procurement collaborations "do not raise antitrust concerns and indeed may be procompetitive. Purchasing collaborations, for example, may enable participants to centralize ordering, to combine warehousing or distribution functions more efficiently, or to achieve other efficiencies." n40 In such cases, the existence of efficiencies flowing from an underlying "efficiency-enhancing integration" of resources supplies a critical ingredient for the avoidance of per se risk. n41

n39 See, e.g., *Mandeville Island Farms, Inc. v. Am. Crystal Sugar Co.*, 334 U.S. 219, 235 (1948) (holding that "it is clear that the agreement [to fix sugar beet prices] is the sort of combination condemned by the Act, even though the price-fixing was by purchasers, and the persons specially injured under the treble damage claim are sellers"); *Sony Elecs., Inc. v. Soundview Techs., Inc.*, 157 F. Supp. 2d 180, 183-88 (D. Conn. 2001) (refusing to dismiss § 1 price-fixing and boycott claims directed at alleged monopsony conspiracy among potential licensees to fix artificially low royalty rates for IP implicated by an SSO standard). The antitrust enforcement agencies have also taken the position that the antitrust laws are violated when SSO members act together to deprive IP holders of royalties by prohibiting the ownership of IP rights in a standard. See HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 35.6c2(B) at 35-51.

n40 U.S. Dep't of Justice & Federal Trade Comm'n, Antitrust Guidelines for Collaborations Among Competitors § 3.31 (a) (2000), available at <http://www.ftc.gov/os/2000/04/ftcdojguidelines.pdf> [hereinafter DOJ-FTC Competitor Collaboration Guidelines].

n41 *Id.* § 3.2; see also *Broadcast Music, Inc. v. CBS*, 441 U.S. 1 (1979).

In the case of the typical SSO, however, the integration and efficiencies needed to justify outright collective

bargaining on royalties are in short supply. As Carl Shapiro has explained, "while the law has typically looked for integration and risk-sharing among collaborators in order to classify cooperation as a joint venture and escape *per se* condemnation, . . . the essence of cooperative standard setting is not the sharing of risks associated with specific investments, or the integration of operations." n42 There is thus considerable risk that an active SSO role in royalty negotiations on behalf of potential licensees (particularly when the potential licensees participating in the standard-setting effort are a significant fraction of all prospective licensees) will not be classified as conduct ancillary to a traditional efficiency-enhancing integration, but instead will be deemed to "create or increase [monopsony] power or facilitate its exercise by increasing the ability or incentive to drive [down] the price of the purchased product." n43

n42 Shapiro, *supra* note 30.

n43 DOJ-FTC Competitor Collaboration Guidelines, *supra* note 40, § 3.31 (a); *but see* Pate, *supra* note 13 ("Some standards development organizations have reported to the Department of Justice that they currently avoid any discussion of actual royalty rates, due in part to fear of antitrust liability. It would be a strange result if antitrust policy is being used to prevent price competition. [Footnote omitted.] There is a possibility of anticompetitive effects from ex ante license fee negotiations, but it seems only reasonable to balance that concern against the inefficiencies of ex post negotiations and licensing hold up."). *See also*, Patterson, *supra* note 12, at 1055-56 ("allowing the standard-setting organization to negotiate a licensing arrangement with the patent holder" involves antitrust risks "because the standard-setting organization could be seen as a vehicle for price-fixing collusion by its members"). Even in cases where the existence of an efficiency-enhancing integration has been apparent in more traditional terms, there remains a threat of expensive and fact-laden rule of reason challenges that may not readily be susceptible to disposition before trial. *See Addamax Corp. v. Open Software Found., Inc.*, 888 F. Supp. 274, 283, 285 (D. Mass. 1995) (granting summary judgment on *per se* but not rule of reason claim of plaintiff whose IP had not been selected by the defendant non-profit industry consortium in its efforts to solicit bids for standardized components of a platform-independent version of the UNIX operating system). Despite the fact that most commentators find the result in *Addamax* problematic, *see* HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 35.4a2 at 35-27 n.16; Shapiro, *supra* note 30, the defendants were obliged to incur the expense of a trial on the merits. *See Addamax Corp. v. Open Software Found.*, 152 F.3d 48 (1st Cir. 1998) (affirming judgment for defendants after trial on causation of damages).

Current antitrust law may not encourage outright collective bargaining over license terms (at least not in the usual case), n44 but antitrust policy need not frustrate all efforts of SSOs to avoid fostering the creation or facilitating the exercise of *ex post* market power by holders of intellectual property rights in standards they adopt. Economics suggests a model of royalty determination that avoids buyer collusion and monopsony, while reserving a role for standard-setting organizations that promotes efficiency through a true integration of resources. We turn next to a discussion of this model and its implications.

n44 This conclusion is not altered by The Standards Development Organization Advancement Act of 2004, Pub. L. No. 108-237, 118 Stat. 661 (codified at 15 U.S.C. §§ 4301 et seq. and accompanying notes). While the Act provides for rule of reason treatment of a "standards development organization" that engages in a "standard development activity," it exempts from the definition of the latter "entering into any agreement or conspiracy that would set or restrain prices of any good or service." *Id.* §§ 103-104.

B. THE Ex ANTE AUCTION MODEL FOR THE CONTROL OF MARKET POWER

One natural solution to the problem of *ex post* market power is for prospective licensees to negotiate contracts in advance of standard selection, when the market is at its most competitive and proponents of alternative technology are actively vying with each other for advantage. Contracts are often used to constrain the *ex post* economic power that a decision maker bestows upon one among numerous contending parties. In more general terms, economists have

explored the nature of competition "for the field" or "for a prize" and the incentives for the contestants involved to compete away the expected *ex post* gains in the effort to gain victory. n45 The theory of franchise bidding and "Demsetz auctions," for example, has explored the opportunity to limit the power of natural monopolies by making the monopoly franchise the "prize" to be won by contesting bidders, with *ex post* pricing and performance constrained to more competitive benchmarks by the terms of the agreed contract. n46 In this context, the "prize" is selection as the standard.

n45 Besen & Farrell, *supra* note 20, at 119.

n46 See, e.g., Harold Demsetz, *Why Regulate Utilities?*, 11 J.L. & ECON. 55 (1968); Eduardo Engel, Ronald Fischer & Alexander Galetovic, *Competition in or for the Field: Which Is Better?* (Yale Univ. Economic Growth Center, Discussion Paper No. 844, Mar. 2002); W. KIP VISCUSI, JOHN M. VERNON & JOSEPH E. HARRINGTON, JR., *ECONOMICS OF REGULATION AND ANTITRUST* 395-409 (3d ed. 2000); JEAN-JACQUES LAFFONT & JEAN TIROLE, *A THEORY OF INCENTIVES IN PROCUREMENT AND REGULATION* ch. 7 (1993). Franchise bidding can theoretically yield pricing below the monopoly level, such as average cost pricing (or even marginal cost pricing if two-part tariffs can be successfully implemented).

Of course, economics teaches that the efficacy of contracting in controlling market power can vary depending on market structure and the characteristics of market participants. A very broad literature addresses and debates the potential shortcomings of contractual remedies in the presence of real-world phenomena such as transactions costs, imperfect information, and incomplete contracts. n47 If anything, however, the markets in which standard setting takes place are more likely than the average case to involve well-informed and experienced participants capable of both performing complex evaluations regarding licensing alternatives and writing sophisticated contracts.

n47 See, e.g., Warren S. Grimes, *Market Definition in Franchise Antitrust Claims: Relational Market Power and the Franchisor's Conflict of Interest*, 67 ANTITRUST L.J. 243 (1999); Benjamin Klein, *Market Power in Franchise Cases in the Wake of Kodak: Applying Post-Contract Hold-Up Analysis to Vertical Relationships*, 67 ANTITRUST L.J. 283 (1999); Carl Shapiro, *Aftermarkets and Consumer Welfare: Making Sense of Kodak*, 63 ANTITRUST L.J. 483 (1995); Severin Borenstein, Jeffrey MacKie-Mason & Janet Netz, *Antitrust Policy in Aftermarkets*, 63 ANTITRUST L.J. 455 (1995); Joseph Farrell & Carl Shapiro, *Optimal Contracts with Lock-In*, 79 AM. ECON. REV. 51 (1989). Much of this literature is directed at interpreting the Supreme Court's decision in *Eastman Kodak Co. v. Image Technical Services, Inc.*, 504 U.S. 451 (1992), a case vitally concerned with the analysis of *ex ante* vs. *ex post* measurements of market power. We are persuaded that a reasonable case can be (and has been) made that an *ex ante* approach to the evaluation (and constraint) of market power is defensible--even when post-contract market power has later arisen--as long as there is: (1) competition at the pre-contact stage, (2) reasonable, though not necessarily complete or perfect, information on the buyer's part, and (3) conduct that is not outside of the (reasonable disclosed) limits imposed by the contract terms. In other words, as Professor Klein explains it, "the reasoning of *Kodak* requires that an actual hold-up take place, not merely that a potential hold-up exists, before throwing out pre-contract competition analysis and using a post-contract definition of market power." Klein, *supra*, at 284.

Despite relatively favorable circumstances for effective contracting in the pre-selection phase of standard-setting endeavors, prospective licensors and licensees still may lack sufficient incentives to engage in such activity. Contracting is costly and it may be perfectly rational for any given potential licensee to avoid the costs of negotiating licenses with all (or even any) potential licensors and adopt a wait-and-see attitude pending the resolution of the selection process. n48 Potential licensors may wish to avoid the expense of bidding for and negotiating over the business of potential buyers at a time when selection is uncertain. Consequently, much or all licensing negotiation between individual parties may take place only *after* a standard has been selected.

n48 Particularly if it is assumed that the terms found in licenses executed before standard selection will be relied on post-selection to implement a general RAND commitment, *cf.* Patterson, *supra* note 12, at 1065 (arguing that pre-standardization license terms are the "best estimate" of reasonable royalties), any given potential licensee will have an incentive to rely on the general RAND commitment and "free ride" on the pre-selection license negotiations of others.

In such circumstances, SSOs can serve an important and procompetitive function by, in effect, conducting "auctions" of their standards in which IP holders "bid" for favorable standard selections through the submission of RAND commitments coupled with specifically disclosed "model" or "representative" licensing terms. n49 A variety of auction processes and methods exist as possible models. n50 One option would be to adopt the "sealed-bid" or "Dutch" auction model and accord all candidates the opportunity to submit (simultaneously) "best and final" responses to the SSO's RFP. This auction form is known to offer a number of benefits, obviously pertinent here, such as discouraging tacit collusion and encouraging entry. n51

n49 *See, e.g.,* Stanley M. Besen, Standard Setting and Intellectual Property: An Outline of the Issues, Statement at the FTC/DOJ Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy (Apr. 18, 2002), *available at* <http://www.ftc.gov/opp/intellect/020418stanleymbesen.pdf> (drawing analogy to "an *auction* held by the producers of the final product in which they award a monopoly to the sponsor of the lowest cost technology but in which they exploit the *ex ante* competition among sponsors to limit the magnitude of the license fee"). It is not even necessary that the SSO make the RAND obligation inescapable in such a process; the SSO need only obligate participants to observe RAND commitments unless and until they expressly and specifically disclaim such undertakings in a public manner (in advance of standard selection). We discuss in Part IV.A below our conclusion that innovators are unlikely to avoid or disclaim RAND obligations (at least when such obligations are interpreted in the manner proposed in this article).

n50 *See, e.g.,* PAUL KLEMPERER, AUCTIONS: THEORY AND PRACTICE (2004).

n51 *Id.* at 114-15. ("In a standard sealed-bid auction (or 'first-price' sealed-bid auction), each bidder simultaneously makes a single 'best and final' offer. As a result, firms are unable to retaliate against bidders who fail to cooperate with them, so collusion is much harder than in an ascending auction. Tacit collusion is particularly difficult since such firms are unable to use the bidding to signal. . . . From the perspective of encouraging entry, the merit of a sealed-bid auction is that the outcome is much less certain than in an ascending auction. . . . It follows that potential entrants are likely to be more willing to enter a sealed-bid than an ascending auction."). *See also* Robert C. Marshall & Michael J. Meurer, *Bidder Collusion and Antitrust Law: Refining the Analysis of Price Fixing to Account for the Special Features of Auction Markets*, 72 *ANTITRUST L.J.* 83, 85-86, 91-93 (2004); VIJAY KRISHNA, AUCTION THEORY 151-62 (2002); ELMAR WOLFSTETTER, TOPICS IN MICROECONOMICS: INDUSTRIAL ORGANIZATION, AUCTIONS, AND INCENTIVES 209-11 (1999).

We assume that such an auction-like process would involve no collective royalty negotiations with any given putative licensor after its "bid" has been submitted to the SSO (though we would not deem it to violate this assumption if, in appropriate circumstances, bidding were to be reopened on a general basis). We further assume that the operative SSO voting (or other decision-making) process would not be unduly susceptible to being skewed or biased by one or more SSO members, much as many antitrust decisions in the area have effectively required. n52 Finally, we assume that all parties would remain free to contract privately outside the standard-setting process, and that participation by potential licensors would be purely voluntary in the sense that "they can decline to participate in the standard-setting organization altogether, or withdraw from consideration of a particular standard in which they have an interest." n53

n52 See, e.g., James J. Anton & Dennis A. Yao, *Standard-Setting Consortia, Antitrust, and High-Technology Industries*, 64 *ANTITRUST L.J.* 247, 255-58 (1995) (noting frequency of analysis of decision-making procedures in standard-setting antitrust cases). Cf. The Standards Development Organization Advancement Act of 2004, Pub. L. No. 108-237, § 103, 118 *Stat.* 661 (codified at 15 *U.S.C.* § 4301) (defining a "standards development organization" eligible for the protections offered by the Act to be one that "us[es] procedures that incorporate the attributes of openness, balance of interests, due process, an appeals process and consensus").

n53 HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 35.6c2(B) at 35-52.

SSO-sponsored auction-like activity in such circumstances would differ materially from per se unlawful collective price negotiation. n54 As a general matter, of course, auction processes are consistent with independent decision making by potential buyers and sellers, and with efficiency. n55 Antitrust law certainly recognizes the lawfulness of auctions and auction institutions, at least when normal safeguards are observed to protect against collusion. n56 Consistently, we would expect it would not violate the antitrust laws in most instances for an SSO to conduct an appropriately designed auction-like process intended to yield detailed RAND commitments by IP holders, on the basis that such conduct is efficiency-enhancing and ancillary to the underlying "integration" of evaluative and consensus-building resources contributed by participating SSO members and coordinated by the SSO. n57

n54 In reaching this conclusion, we do assume that participants in the standard-setting process are not (or should not be) unduly restricted or limited in their ability to receive objective summaries or comparisons of offered royalties or other economic terms or to discuss, evaluate, and compare (on an individual, common, or collective basis) the technical merits of competing submissions, though we recognize that it has been said that there is a risk that "antitrust counsel is likely to circumscribe the information exchanges more than is absolutely necessary, particularly because what is necessary for antitrust purposes is not always well defined." Anton & Yao, *supra* note 52, at 264. In this regard, a salutary effect may flow from the provisions of The Standards Development Organization Advancement Act of 2004, Pub. L. No. 108-237, §§ 103-104, 118 *Stat.* 661 (codified at 15 *U.S.C.* §§ 4301-4302), which apply rule of reason treatment to a "standards development organization" that engages in a "standard development activity," including "exchanging information among competitors relating to cost, sales, profitability, prices, marketing, or distribution of any product process of service" insofar as the exchange is "reasonably required for the purpose of developing or promulgating a voluntary consensus standard."

n55 Of course, as already noted, some auction forms are better suited than others to deterring tacit collusion. Efficiency properties can also vary with auction method. See, e.g., KLEMPERER, *supra* note 50, at 28-34.

n56 See, e.g., *Hudson's Bay Co. Fur Sales, Inc. v. Am. Legend Coop.*, 651 *F. Supp.* 819 (D.N.J. 1986) (rejecting antitrust claims against an association of American mink farmers relating to arrangements for auction of mink pelts by a subsidiary of the association). Of course, many cases have addressed alleged collusion to rig bids or sales terms in auction contexts. See, e.g., *DeLoach v. Philip Morris Cos., Inc.*, 1:00 CV01235 2001 U.S. Dist. LEXIS 16909 (M.D.N.C. July 24, 2001) (rejecting motion to dismiss antitrust claims where plaintiffs alleged "that Defendants conspired before the auctions to rig bids [so that] . . . the allocation that took place at the auctions allegedly was a result of Defendants' collusion, which preceded standard auction procedure"); *In re Auction Houses Antitrust Litig.*, 193 *F.R.D.* 162 (S.D.N.Y. 2000) (certifying class action based on alleged collusion among auction houses with regard to buyer's premiums and seller's commissions).

n57 Cf. HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 35.6c2(B) at 35-53 ("standard-setting organization rules restricting the exercise of intellectual property rights in a standard should generally be permissible").

To illustrate the operation of the auction model, consider a simplified scenario in which the competing holders of IP (patents, say) offer bids of a license fee per unit of output to downstream users who are choosing which patent should be embodied in a standard. We assume that all investments in R&D by the patent holders already have been sunk and patent holders do not anticipate incurring any future costs as a consequence of licensing their patent. They will not be obligated to incur costs for further development, to provide support, or to manage the license contract. To simplify the analysis, we also assume that the choice of patent has no effect on the quality of the downstream product, but does affect the downstream production costs of downstream producers and affects all downstream producers identically. We further assume that many downstream firms use the IP to produce perfect substitutes, but that patent owners do not also produce final products. n58 Let us say that use of the "best" IP option, patent A, would result in downstream production costs of 5 per unit of output (incremental and average costs), that use of B would result in downstream productions costs of 6 per unit, and all other IP choices would result in higher downstream production costs. If all this is known and the patent holders compete to be chosen by offering per unit license fees, the outcome is clear. The holder of patent A will offer a license fee just less than 1 per unit of output and be chosen. Downstream producers that use A and pay a license fee of just less than 1 will have costs just under 6 per unit, lower than if they had used any other patent, even royalty-free.

n58 We discuss the case of IP holders who are downstream competitors in Part III, *infra*.

The simplifying assumption made above that patent holders incur zero recurring costs is highly unrealistic in our view (as discussed further in Part II.C.1, *infra*), but the analysis is easily modified to allow for recurring costs. If we assume, instead, that each putative licensor incurs recurring costs of c per unit of downstream output, then no holder of IP will accept a license fee lower than c . The "best" IP option will be able to command a license fee equal to c plus the difference in value between the best and the next-best alternatives. In our simple example, the difference in value between the best and next-best options was 1 ($= 6 - 5$), which also equaled the license fee with zero licensing costs. If licensing costs instead are c , the best alternative could command a license fee of $c + 1$ because the holder of the next-best alternative would not accept a fee lower than c . As rival IP solutions come closer and closer to being perfect substitutes (in the simple example, converging at a downstream unit cost of 5), the competitive royalty will approach c , the incremental cost of recurring innovation and licensing expenses.

The simple example also can be used to illustrate the particular utility of the *ex ante* auction model in cases where the putative licensor gains the power to exploit licensees because licenses are locked-in by switching costs arising from sunk relationship-specific investments. Once buyers sink relationship-specific investments that increase their costs of switching to alternatives, sellers have an incentive to act opportunistically and "hold-up" buyers by forcing them to accept a higher price or lower quality. n59 To illustrate using our example, make the further assumption that each downstream producer must sink investments equivalent to costs of 3 per unit of output in equipment to use any of the IP, but that each patent requires producers to use a somewhat different machine. Once they purchase the machinery used with particular IP, producers must incur an additional cost of 3 per unit to switch to another patent. If a producer purchased machinery to use with the best IP option, A, without a binding (*ex ante*) commitment on A's license fee, A could charge a license fee up to 4 per unit--equal to the switching cost of 3 plus the buyer's saving of 1 in recurring cost from using the best IP--without inducing downstream producers to switch to B. There is a rich literature in economics recognizing that rational buyers will negotiate contracts that seek to prevent such opportunistic hold-ups by regulating the relationship in advance and limiting what the seller is allowed to do. n60

n59 See, e.g., VISCUSI, VERNON & HARRINGTON, *supra* note 46, at 407-09; Klein, *supra* note 47; Shapiro, *supra* note 47; Farrell & Shapiro, *supra* note 47; OLIVER WILLIAMSON, *THE ECONOMIC INSTITUTIONS OF CAPITALISM* (1985); Timothy J. Muris, *Opportunistic Behavior and the Law of Contracts*, 65 MINN. L. REV. 521 (1981).

n60 See, e.g., Benjamin Klein, *Market Power in Antitrust: Economic Analysis After Kodak*, 3 SUP. CT.

ECON. REV. 43, 50-51 (1993); Muris, *supra* note 59.

We would prefer to use the term "market power" to refer to the power to exploit all of the buyers in the pertinent market, and not just some particular buyers who have taken steps that make them particularly vulnerable to exploitation, as when they have locked themselves in by undertaking highly specialized investments. We acknowledge, however, that the term is sometimes applied to the seller's relationship-specific power to exploit locked-in buyers. n61 It bears emphasis, however, that hold-ups can occur in the absence of *any* market power in the narrower or more "traditional" sense. n62 Yet in the standard-setting context the *ex post* emergence of "traditional" market power in the technology market can enhance the "hold-up power" flowing from individual lock-in if exercise of the traditional market power increases post-selection switching costs. In other words, protecting against opportunism takes on greater significance in the standard-setting context because an ineffectively constrained licensor may have *ex post* incentives to exploit *both* "traditional" market power and relationship-specific power.

n61 We agree with the many commentators who have questioned the wisdom of any policy decision that treats the short-run abuse of relationship-specific power as equivalent to the exercise of economic power of the more durable sort held by a monopolist or dominant firm. Where "traditional" market power is lacking, as in the typical franchising or aftermarket case, it seems reasonable for antitrust policy to rely more heavily on the market mechanism to deter or discipline exploitation of locked-in customers, e.g., through the supplier's need to maintain its reputation for fair dealing in order to continue to entice previously uncommitted customers into new relationships. See, e.g., *Maris Distrib. Co. v. Anheuser-Busch, Inc.*, 302 F.3d 1207, 1219 (11th Cir. 2002), *cert. denied*, 537 U.S. 1190 (2003) ("while a party who exercises contract power *may* have market power and *may* violate the antitrust laws under some circumstances, the mere existence and exercise of contract power does not show that a defendant had market power or violated the law. In other words, courts must attempt to ascertain a defendant's economic position in the relevant market, rather than its power pursuant to a particular contract, when considering whether a defendant has market power."); *Hack v. President & Fellows of Yale College*, 237 F.3d 81, 85 (2d Cir. 2000) ("Economic power derived from contractual arrangements affecting a distinct class of consumers cannot serve as a basis for a monopolization claim.").

n62 See, e.g., Klein, *supra* note 60, at 59 (concepts of monopoly power and opportunism are distinct); Muris, *supra* note 59, at 523 (opportunism is not a problem of precontractual monopoly); Kattan, *supra* note 25, at 10 ("circumstantial" market power associated with contracting problems may exist in many situations not commonly called monopolies); Farrell & Shapiro, *supra* note 47, at 51 ("Even if competition is perfect *ex ante*, once a relationship is established there is some *ex post* bilateral monopoly, which . . . can lead to problems of *opportunism*"). When there appears to be no threat of traditional market power--as when, for example, a standard fails to win acceptance in the marketplace--even acts, such as the use of IP to exploit locked-in customers may be insufficient to justify antitrust remedies. Failed standards can give rise to "last period" problems, when a supplier finds it profitable (even when lacking power in the broader market) to engage in short-term customer exploitation because its short-term gains from holding up its locked-in customers may be greater than the long-term losses from such a policy. See, e.g., Klein, *supra*, at 56-57 & n.28. Lock-in may be a less significant problem in the case of failed standards, however, if the technology market is subject to network effects, as the costs of switching to an alternative--and widely adopted--standard may be trivial or may even be outweighed by the benefits.

C. ECONOMIC CHARACTERISTICS OF A "REASONABLE" RAND ROYALTY

As a general matter, then, we would deem a royalty to be "reasonable" for RAND commitment purposes--and would correspondingly deem the underlying standard-setting process that generates the royalty to be (to that extent) antitrust compliant--when the royalty is the outcome of an auction-like process appropriately designed to take lawful advantage of the state of competition existing *ex ante* (i.e., in advance of standard selection) between and among the available IP options. We acknowledge, of course, that standards auctions may not always yield results as socially

desirable as those of the basic model, particularly if the number of competing IP solutions is very limited and there is incomplete information about the value of each. Yet even when a standard-setting body does not implement an auction procedure, we believe that our basic model supplies an analytical framework and benchmark for what constitutes a reasonable royalty. Economic analysis suggests several characteristics of the "reasonable" RAND royalties that are likely to emerge from *ex ante* competitive auctions.

(1) *Non-Zero Royalties*. First, we would not expect "reasonable" royalties to be equal to zero. That is, we would not expect a RAND obligation to be interpreted to require "royalty free" licensing. n63 This may seem slightly surprising in view of what may be deemed the conventional textbook view regarding the social inefficiency of charging positive royalties for the licensing of intellectual property. On this view, once an innovation has emerged from the R&D process, if there is no further improvement, the cost of the IP is entirely sunk, a piece of ancient history, which in the purely theoretical model should be irrelevant for current and future pricing. *Ex post*, economists recognize, the incremental cost to society of an IP license is zero (excluding trivial transactions costs) and this is equally true of total or average cost. The royalty is, therefore, simply a transfer payment from the point of view of society; positive royalties thus provide the IP owner with marginal revenue that exceeds society's marginal cost and thereby lead to underutilization of the IP. Many final-product suppliers who could make good use of it and offer consumers cheaper and better outputs in greater quantities are deterred from doing so by the nonzero price. n64

n63 See also discussion of royalty-free licensing *infra* Part III.H.

n64 Here, we are addressing the standard *static* textbook view (concededly something of a straw man), which disregards the dynamic benefits when superior technology earns rents and provides incentives for future innovative activity. Our point in this section is that we would expect reasonable fees to exceed zero even when there are equally good alternatives *ex ante*.

In contrast with the standard (and static) textbook view, a more realistic picture recognizes that licensing often obligates the licensor to bear a plethora of ongoing incremental costs. For example, transactions costs may not be quite so inconsequential as often assumed in theory. The licensing of IP, in addition to involving costs of negotiation, contracting, accounting, monitoring, and auditing, also frequently involves the costs of instruction, training, and 24-hour assistance. More significantly, in the modern economy R&D outlays in a product are not a once-and-for-all matter. Fortunately for society, competing firms force one another constantly to engage in substantial R&D expenditures to keep upgrading their products. n65 The license fee must contribute to coverage of this constant stream of costs and offer a profit incentive--a "normal" return on recurring investment in innovation--for the firms to undertake the expenditures. In such industries, the firm's pricing and investment considerations must always be *ex ante*, never *ex post*. And in such circumstances nonzero license fees (or their equivalent in some other form of payment) are needed to provide the incentives to elicit the continuing investment in IP called for by the public interest, and efficient resource allocation requires this fee to enter the *marginal* payment incurred by the licensee. Even license fees determined in an *ex ante* auction process must equal or exceed this level.

n65 See WILLIAM J. BAUMOL, *THE FREE-MARKET INNOVATION MACHINE: ANALYZING THE GROWTH MIRACLE OF CAPITALISM* (2002).

(2) *Relation to Cost*. Second, we would expect the relationship between a "reasonable" royalty rate and the incremental cost of recurring innovation and licensing (inclusively defined, as discussed above) to depend directly on the extent or degree of *ex ante* competition. Our numerical illustration of the auction process in Part II.B, *supra*, makes the simplifying (but highly unrealistic) assumption that all investments in R&D by the patent holders had already been sunk, that no ongoing or future innovative activities were anticipated as part of the business, and that there were no other costs of licensing. Once these assumptions are relaxed, as invariably they must be, these recurring incremental costs of innovation and licensing place a floor under the royalty that will result from an *ex ante* competitive auction

process. As we have already noted, the "best" IP option will be able to command a license fee equal to incremental cost plus the difference in value between the best and the next-best alternatives. The greater the number of technologies that compete in advance of standard selection and the closer their IP solutions are to being perfect substitutes (so that the difference in value among alternatives approaches zero), the more likely a reasonable royalty will approach incremental cost. We would not expect a reasonable royalty to be supracompetitive (by materially exceeding incremental cost plus a normal return on recurring investment) except when an IP holder possesses market power *ex ante* (e.g., when no or few significant substitutes exist for the innovation the IP holder has created).

(3) *Differential Pricing*. Third, we would not expect that "reasonable" royalties would invariably be uniform and identical across all fields of use, territories, and customers. The difference in value between the best and next-best IP often may vary among users of the IP and, thus, so may the reasonable royalty. Nor should this be seen as necessarily undesirable. Economic analysis shows that differential pricing is often unavoidable for suppliers as a matter of minimal financial viability, and is a common feature of competitive markets, including markets for intellectual property. n66 Indeed, the inherent nature of intellectual property tends to facilitate the practice of customer selection and the prevention of arbitrage, factors that make price discrimination feasible. n67 Differential pricing of IP licenses for different fields of use is quite common, for example. Of course, countervailing forces that impede the practicability of discrimination may also operate in the standard-setting context--particularly, transparency in the auction and selection process--with the net effect varying from case to case. Nonetheless, there is no reason to suppose that uniform pricing will inevitably ensue.

n66 See, e.g., William J. Baumol & Daniel G. Swanson, *The New Economy and Ubiquitous Competitive Price Discrimination: Identifying Defensible Criteria of Market Power*, 70 *ANTITRUST L.J.* 661 (2003); Benjamin Klein & John Shepard Wiley, Jr., *Competitive Price Discrimination as an Antitrust Justification for Intellectual Property Refusals to Deal*, 70 *ANTITRUST L.J.* 599 (2003); Richard T. Rapp & Lauren J. Stiroh, Standard Setting and Market Power, Statement at the FTC/DOJ Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy (Apr. 18, 2002), available at <http://www.ftc.gov/opp/intellect/020418rappstiroh.pdf>.

n67 See, e.g., HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 4.3e at 4-57 ("Discrimination in patent licensing may be more common than in the case of ordinary contracts because the licensor is able to engage in customer selection and perhaps to prevent arbitrage within the patent licensing process."). We speak here only of literal discrimination, leaving for Part III, *infra*, a discussion of when and under what circumstances discrimination is likely to be anticompetitive.

The preceding, abstract observations provide only limited guidance in applying the RAND concept in the messy circumstances of concrete disputes. Nonetheless, the analysis presented here is quite powerful as a roadmap to a method both for defining and determining the level of a reasonable RAND royalty. Indeed, there is simply no excuse for a RAND commitment to amount to little more than an empty promise or a pious platitude. So long as SSOs structure the standard selection process appropriately to elicit up-front competition in the submission of particularized licensing terms, the question of what a "reasonable" royalty is amounts to a straightforward matter of direct comparison to the terms submitted before standard selection.

A recent case, *Townshend v. Rockwell International Corp.*, n68 can be read to illustrate some of the principles discussed above. In relevant part, the case involved an antitrust claim against an IP holder for allegedly refusing to license its technology on reasonable terms after prevailing upon an SSO to adopt a standard incorporating the IP. The district court rejected this claim on several grounds. While the court may have somewhat hastily rejected the plaintiff's argument that the industry standard conferred market power on the incorporated patent, n69 it plainly found no basis for an allegation of *ex ante* power in view of the plaintiff's improper reliance on the mere existence of the patent and its failure to allege any dominant market share in the technology market. n70 Independent of this finding, the court rejected the *ex post* licensing challenge on the ground that there was no allegation that the IP holder had refused to license the

antitrust plaintiff in accordance with the proposed licensing terms and conditions that had been submitted to the SSO and its members before the standard was adopted. n71 In effect, the court was rejecting the antitrust plaintiff's hold-up claim in deference to the SSO's ability to protect potential licensees by properly structuring the selection process to elicit reasonably competitive license terms.

n68 *2000-1 Trade Cas. (CCH) P 72,890 (N.D. Cal. 2000)*.

n69 The court erroneously reasoned that the "adoption of a [sic] industry standard incorporating . . . proprietary technology does not confer any power to exclude that exceeds the exclusionary power to which a patent holder is otherwise legally entitled." *2000-1 Trade Cas. (CCH) P 72,890 at 87,636*. It was noted, however, that the antitrust plaintiff had not alleged that the industry standard prevented the development of competing proprietary technology.

n70 *Id.* at 87,636-37.

n71 *Id.* at 87,633-34 & 87,636. The Court observed that the adoption of the standard by the SSO "suggests that the [SSO] was satisfied that the proposed terms submitted by [defendant] evidenced a willingness by the [defendant] to negotiate non-discriminatory, fair, and reasonable terms." *Id.* at 87,633. Patterson argues the court was "incorrect" to think that the "absence of any royalty increase after the adoption of the standard was evidence of the reasonableness of the terms" on the ground (Patterson contends) that the licensing proposal had been submitted to the SSO "in anticipation of standardization." *See Patterson, supra* note 12, at 1066. This criticism is unpersuasive, however, as there is no indication that the proposal in question was submitted *after* the pertinent time (i.e., after standard selection by the SSO). As previously discussed, a pre-standard-selection proposal (in the form of model terms or otherwise) will normally be subject to the pressures of *ex ante* competition save for the case where a putative licensor "anticipates" selection because of the lack of any viable alternatives--but then *ex ante* competition is absent and the licensor is guaranteed a monopoly-level royalty in any event.

III. NONDISCRIMINATORY ROYALTIES IN THE STANDARD-SETTING CONTEXT: THE ROLE OF ECPR

A. THE RATIONALE FOR CONTROLLING AND THE MEANS FOR IDENTIFYING DISCRIMINATORY ROYALTIES

We suggest in the preceding section that a RAND commitment to "reasonableness" may (and should) be given meaning relative to the benchmark of *ex ante* competition. A RAND commitment, however, involves an obligation not just of reasonableness in licensing but of "nondiscrimination" as well. This, in turn, raises two critical issues: (1) why and to what extent is it important to avoid discrimination and (2) how can injurious discrimination be recognized and prevented?

Turning to the first issue, we see no rationale for treating all manifestations of discrimination as equally injurious or, indeed, for treating discrimination as always and necessarily injurious. We have already noted that royalties that are "reasonable" for RAND purposes may be literally discriminatory given that such discrimination can be consistent with (and often can be compelled by) the existence of competition. n72 Economic analysis also shows that price discrimination often benefits many consumers and sometimes even all of them. n73 In fact, economic theory teaches that the license fees that may be deemed to serve the general welfare most effectively in the case of a monopoly licensor are the systematically discriminatory fees supplied by the so-called Ramsey pricing formula. n74

n72 *See supra* Part II.C.3.

n73 *See, e.g., Klein & Wiley, supra* note 66, at 611-19; Rapp & Stiroh, *supra* note 66.

n74 Named after its discoverer, the young Cambridge mathematician-philosopher, Frank Ramsey. See Frank Ramsey, *A Contribution to the Theory of Taxation*, 37 ECON. J. 47 (1937). In the simplest case the theorem calls for prices that satisfy the "inverse-elasticity formula" in which the socially optimal price to a customer is selected to deviate from the product's marginal cost in inverse proportion to the customer's elasticity of demand for the product, and by an amount just sufficient to compensate the supplier appropriately in the aggregate. The prices yielded by this theoretically ideal formula are systematically discriminatory, entailing relatively high license fees for users of the IP whose demand elasticity is low and who are therefore the most vulnerable to high charges, and lower fees to users with higher demand elasticities who generally have fairly good alternatives available to them at affordable prices.

There is a subset of cases, however, where *potentially* valid reasons exist for concern about discrimination in license fees for intellectual property: those instances when the owner of the IP uses it as an input in a downstream market where competitors also require the IP for the same purpose. A licensor exercising bottleneck market power that discriminates in licensing in order to handicap its competitors and favor its own downstream sales can create or enhance market power in downstream markets for standard-compliant products and services. n75 By contrast, a pure licensor (even one with monopoly power) will ordinarily lack anticompetitive reasons for engaging in discrimination. n76 As one leading treatise observes, "the only plausible anticompetitive explanation for [discriminatory license pricing] is as an act of foreclosure by a vertically integrated monopolist." n77 We suggest that this possibility is (or should be taken to be) the principal justification for the RAND nondiscrimination requirement.

n75 In somewhat analogous cases, the "price squeeze" doctrine has been applied under Section 2 where it has been alleged that a vertically integrated monopolist has set its wholesale prices or rates so high that its customers cannot compete with it in the downstream market. See *Town of Concord v. Boston Edison Co.*, 915 F.2d 17, 18 (1st Cir. 1990). The seminal price squeeze case is *United States v. Aluminum Co. of Am.*, 148 F.2d 416, 437-38 (2d Cir. 1945) (L. Hand, J.), which concerned the acts of Alcoa, a monopolist in the production of aluminum ingot, in selling to independent fabricators, some of which turned the ingot into sheet aluminum in competition with Alcoa. Judge Hand concluded that because Alcoa set the ingot price "higher than a 'fair price,'" and because its sheet price was so low that its competitors could not match the price and still make a "living profit," there was a violation of § 2. Later cases have dispensed with the "fair price" test in favor of alternative tests, such as the transfer price test (evaluating whether the defendant could have earned a profit if assumed to purchase the monopoly input at the prices charged to its downstream competitors), and the comparative rate of return test (examining downstream profit margins and their relation to upstream profit margins on sales to downstream competitors). See, e.g., *Ray v. Indiana & Mich. Elec. Co.*, 606 F. Supp. 757, 776-77 (N.D. Ind. 1984), *aff'd*, 758 F.2d 1148 (7th Cir. 1985).

n76 This does not mean that discrimination in pricing can have no downstream impact when a licensor is not vertically integrated. If lower input prices are charged to downstream firm A than to its competitor B, that can constitute a competitive disadvantage that even threatens B's continued existence, just because B is more vulnerable to the extraction of high payments from it. One might even argue that that such discriminatory pricing, if not precisely adjusted to differences in the cost of providing the IP to the two competing firms (which often may be negligible), threatens to produce anticompetitive results. But a rational purpose for seeking such effects is normally lacking when the licensor is not a downstream supplier; to the contrary, seeking such effects would be anomalous as a licensor generally will have no incentive to exclude a customer that is less efficient than its rivals. This is not to claim that there are no circumstances where it may be rational for a monopoly supplier that is not integrated downstream to refuse to deal with or otherwise discriminate against downstream customers in order to maintain its upstream monopoly secure against attack by upstart rivals (see Carlton, *supra* note 29, at 666-71), but there is no reason to believe that these circumstances are very common.

n77 HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 13.5c at 13-53.

Legal practice is consistent with our suggestion. The courts have generally rejected the notion that it is a violation of law, without more, when licensees are charged differential royalties, even when the licensor is a true monopolist. Under the patent laws, for example, patent holders are generally permitted to seek to maximize their income by charging different royalties to different licensees. n78 Similarly, the discriminatory pricing of licenses does not violate antitrust law in and of itself. n79 Colorable claims of antitrust violations involving discriminatory pricing, rare as a general matter, require something more: plausible allegations of adverse effects on *competition*. n80 Accordingly, in this article we interpret the "nondiscrimination" component of the RAND obligation as applying to and regulating the licensing conduct of vertically integrated--but not pure--licensors for the purpose of preventing anticompetitive acts in the market for downstream products and services.

n78 See *USM Corp. v. SPS Techs., Inc.*, 694 F.2d 505, 512 (7th Cir. 1982); HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 3.3b7 at 3-34-3-35.

n79 See, e.g., *Blue Cross & Blue Shield United v. Marshfield Clinic*, 65 F.3d 1406, 1412-13 (7th Cir. 1995) ("the firm could have charged whatever prices it wanted, including prices that discriminated against some of the users (monopolists frequently price discriminate), because the antitrust laws do not regulate the prices of natural monopolists. A natural monopolist that acquired and maintained its monopoly without excluding competitors by improper means is not guilty of 'monopolizing' in violation of the Sherman Act, and can therefore charge any price that it wants.") (citation omitted); HERBERT HOVENKAMP, *FEDERAL ANTITRUST POLICY* 570 (2d ed. 1999) ("As a general matter, a monopolist may lawfully set its profit-maximizing price, and price discrimination is not itself an 'exclusionary' practice.").

n80 See, e.g., HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 13.5c at 13-52 ("There are a few cases . . . which allege that a discriminatory price in an intellectual property license is illegal not in and of itself, but rather because it facilitates the exclusion of disfavored competitors and therefore helps to maintain a monopoly."); 2 ABA SECTION OF ANTITRUST LAW, *ANTITRUST LAW DEVELOPMENTS* 1061 (5th ed. 2002) [hereinafter *ANTITRUST LAW DEVELOPMENTS*] ("in order to demonstrate that a differential royalty licensing regime violates Section 2, the challenger must demonstrate an adverse effect on competition").

Of course, it should be apparent that the principal line of defense against discriminatory fees that are potentially *anticompetitive* in the downstream market is the promotion of *ex ante* competition in the licensing market and the generation of competitively *reasonable* (even if sometimes literally discriminatory) royalties. We acknowledge, however, that this line of defense may be insufficient. IP holders may possess market power *before* the standard setting exercise begins, so that even an SSO-facilitated standards auction will not create competition. Alternatively, even when *ex ante* competition is thriving, an SSO may fail to capitalize effectively on it (e.g., by not creating auction-like conditions), so that there are no precise or administrable limits on reasonableness in the first instance. These considerations lead us to our second critical issue--the question of what principles should be used to identify "discriminatory" royalties for RAND purposes.

As we have already discussed, a purely literal approach to defining discrimination would be overbroad. n81 The primary issue of concern in interpreting RAND commitments of nondiscrimination arises where the patent holder (for example) is licensing to a horizontal competitor in the product or service that uses the patented technology. The RAND criterion is most difficult to define in such cases because, while the fee charged to the licensee may be easy to observe, the fee that the licensor, in effect, charges to itself, is neither directly observable, nor even easily defined. Yet, it is clear that an implicit fee paid by the licensee to itself that is materially lower than that charged to its competitors can undermine the ability of the latter to compete. n82

n81 A literal approach is taken under § 2(a) of the Robinson-Patman Act, which defines discrimination as "merely a price difference." See *FTC v. Anheuser-Busch, Inc.*, 363 U.S. 536, 549 (1960). The Robinson-Patman

Act, however, does not apply to intellectual property licensing as such because only transactions in commodities come within its purview. *See* HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 13.5c at 13-51; 2 *ANTITRUST LAW DEVELOPMENTS*, *supra* note 80, at 1061.

n82 *Cf.* U.S. Dep't of Justice Antitrust Division, Policy Guide to Merger Remedies, § III.E.2.b at 24 (2004), available at <http://www.usdoj.gov/atr/public/guidelines/205108.pdf> ("if the upstream and downstream firms have merged in such a manner that the sales price to the acquired downstream firm becomes a mere internal accounting factor, the upstream firm could set a high, non-discriminatory price to downstream firms that would nonetheless disadvantage the acquired downstream firm's competitors. A fair dealing provision might then be ineffective.").

There are two immediate questions here. The first and most obvious is how can one impart substance to that apparently nebulous concept, "the fee that the IP proprietor charges itself?" Second, if one can find a way of evaluating that fee and expect the owner of the IP to charge that fee to licensees, can we also expect that fee to be compensatory to the IP holder? From the legal point of view, can such a fee be deemed to constitute an improper taking? From the point of view of the social welfare, will the fee constitute an appropriate incentive for innovative activity?

Efficiency considerations enter the matter directly. Too high a license fee is clearly a handicap to more efficient competitors of the IP holder, whereas too low a fee is a relative (competitive) disadvantage to the IP owner, no matter which of them is the more efficient supplier of the remainder of the final-product manufacturing process. n83 The issue, then, is whether a pricing rule exists that prevents these types of inefficiencies, either of which might increase the social costs of the use of inventions.

n83 In particular, if the license price is not sufficient to enable the innovator to cover its recurring outlays, that price will clearly constitute a subsidy from the innovator to the licensee.

An apparent solution would be to require all users, including the technology owner, to pay the same license fee. Reality, however, does not provide such an easy way to prevent discrimination among final-product suppliers that unequally affects their ability to compete. For, as just noted, the price that the patent holder *really* charges itself for use of the invention as an input is far from clear. A price may be specified in the firm's accounting records, but that is generally an artificial and arbitrary number that tells us nothing about what the owner really gives up financially (that is, what the firm really pays) when it supplies that invention input to itself. After all, a rise in that accounting price merely moves money from one of the firm's pockets to another. It is necessary to search further to determine what price the patent holder is really paying for the invention input it provides to itself.

The literature on economic regulation provides a way to deal with these questions and give substance to the RAND criterion of nondiscrimination. We derive a principle for determining license fees based on the "efficient component pricing rule" (ECPR) that will be shown to be both necessary and sufficient for a license fee to be competitively neutral in downstream markets and, therefore, at least on that basis, a necessary condition for that fee to be nondiscriminatory. That is to say, *any license fee that substantially departs from the ECPR level can be deemed to violate the RAND requirement of nondiscrimination*. We will show also that the ECPR fee can, indeed, be considered to be what the IP owner implicitly charges itself for use of the property, and that such a fee can be deemed fully compensatory. n84

n84 What cannot be claimed for ECPR, however, is that it prevents any excessive earnings by the IP holder that derive from the control of bottleneck IP. As previously discussed, pre-selection evidence of value in the presence of *ex ante* competition can be used to cap at a "reasonable" level the royalty charged for such IP.

We recognize that, even if these conclusions are accepted, it may not follow that the courts should undertake enforcement of this or any related standard. The courts quite appropriately resist assuming the supervisory role of a regulatory agency, and particularly so when it comes to the issue of price setting. n85 Still, especially in circumstances

where it is alleged that differential pricing is anticompetitive in the downstream market, ECPR can provide guidance in determining whether the fees at issue do or do not satisfy a RAND commitment to avoid discrimination. At a minimum, compliance with ECPR should constitute a "safe harbor" that suffices to disprove an allegation of anticompetitive discrimination (even if noncompliance need not be taken as conclusive evidence of anticompetitive conduct).

n85 See, e.g., *Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 408 (2004) (antitrust courts are "ill-suited" to "act as central planners, identifying the proper price, quantity, and other terms of dealing"). One of the virtues of the *ex ante* auction-based approach to the determination of reasonableness for RAND purposes is that it generates objective data that can be directly consulted by a court or other decision maker.

B. THE PARITY PRINCIPLE FORMULA FOR ACCESS PRICING: THE LICENSE FEE AN IP PROPRIETOR IMPLICITLY CHARGES ITSELF

The economics of price regulation provides a pricing principle that can be used to determine an efficient, nondiscriminatory licensing fee for technology. This principle has been referred to as the *efficient component-pricing rule* (ECPR) or as the *parity principle*. n86 Despite its distinctive nomenclature, the rule is merely a variant of familiar elementary principles for efficiency in pricing. The parity principle tells us that the price that the IP-holder firm charges itself for the use of its own innovation input equals the price the firm charges customers for a final product using that IP, minus the incremental cost n87 to the IP-holding firm of all other inputs, including capital, used to produce the final product. The parity principle tells us that this is the price that the monopoly owner of any bottleneck input (such as a patent or other IP) that is indispensable to the activities of all the final-product competitors implicitly charges itself for that bottleneck input. It is, consequently, the price at which the competing final-product providers should be entitled to purchase the bottleneck input.

n86 The discussion here draws heavily on William J. Baumol & J. Gregory Sidak, *The Pricing of Inputs Sold to Competitors*, 11 YALE J. ON REG. 171 (1994), and William J. Baumol & J. Gregory Sidak, *The Pricing of Inputs Sold to Competitors: Rejoinder and Epilogue*, 12 YALE J. ON REG. 177 (1995). The basic approach was contributed by Robert D. Willig, *Customer Equity and Local Measured Service*, in PERSPECTIVES ON LOCAL MEASURED SERVICE 71 (Joseph A. Baude et al. eds., 1979).

n87 The term "incremental cost," though widely used in regulatory arenas, is less familiar to economists. It refers to the addition to a supplier's total cost that results from any given addition to the output of one of its products. Thus, it is analogous to marginal cost but is often used to refer to larger increments in output. It may be used to refer to the incremental cost of an entire product; that is, if the firm is producing x units of good X and a number of other products, it refers to the amount that supply of these x units adds to the firm's total outlays.

Proving that this principle yields the implicit price the licensor charges itself is not difficult. Because we cannot directly observe the fee that the licensor is charging itself, we need an alternative test, with observable components, to determine whether or not a licensor that sets such a license fee is charging others the same fee that it pays itself. Such a substitute test is provided by the following observation. If, and only if, two independent producers of a commodity pay the same license fee for the technology they employ, the difference between the prices at which the two firms can afford to sell a unit of the final product profitably will be exactly equal to the difference between the costs of their remaining inputs. If the remaining input cost of the competitor is X cents lower per unit of final-product output than the cost of other inputs to the IP owner, and the rival can afford to provide the final product exactly X cents more cheaply than the IP owner, then both of them must be paying the same fee for use of the IP. Alternatively, if the costs of other inputs are the same for both firms, a license fee set by the parity principle will allow them to sell the final product at the same price.

C. DERIVATION OF THE PARITY-PRICING (ECPR) LICENSE FEE

All of this can be described formally, giving explicit formulas for an efficient, nondiscriminatory license fee. We use the following notation:

$P[f,i]$ = the price charged by the IP owner, I, per unit of final product;

$\min P[f,c]$ = the minimum price per unit for the final product at which production by a competitor, C, is viable;

$P[i]$ = the price I charges per unit of final product for a license to use the IP;

$IC[r,i]$ = the incremental cost per unit of final product to the IP owner I of the inputs other than IP it uses to produce the final product;

$IC[r,c]$ = the corresponding incremental cost of other inputs for the competitor;

$IC[i]$ = any direct incremental cost (per unit of final product) the IP owner incurs to use the IP itself or to license it to others. n88

n88 This cost may vary depending on who uses the IP. For example, if the personnel of the owner of the invention learned how to use it during the development process and require no further instruction, while licensees need training for its use, the incremental cost of use by the two types of firm will clearly differ. In such cases, the parity-price formula must be modified in a straightforward way, with the prices to different users of the invention differing by the variation in the cost to the IP owner of their usage.

We assume here that final products of the IP owner and licensees are perfect substitutes (but explore the consequences of relaxing this assumption in Part III.J, *infra*). As demonstrated below, the efficient component pricing rule requires that the licensing price satisfy either (and hence both) of two equivalent rules. The first is expressed in the formula:

(1) $P[i] = P[f,i] - IC[r,i]$ [license price = the IP owner's final-product price -- the IP owner's incremental cost of remaining inputs].

Alternatively, the ECPR price of the bottleneck input must satisfy:

(2) $P[i] = IC[i] + \text{the IP owner's incremental opportunity cost of licensing to others} = IC[i] + \text{the IP owner's profit per unit of final-product output.}$

Equations (1) and (2) are equivalent, as will be shown.

Equation (1) tells us that the ECPR establishes a tight link between the price, $P[f,i]$, that the IP owner charges for its final product and the price, $P[i]$, it charges its rivals for the license to use the IP. If incremental production costs do not change, efficiency requires that an increase in the per unit price the IP holder charges either for its final good or to its licensees must be matched dollar for dollar by a rise in the other. Equation (2) tells us that the efficient price of the license is the direct incremental cost to the owner of the IP resulting from use of the invention by others, plus the associated incremental opportunity cost. This opportunity cost is the IP holder's loss of profit from the final product that results when IP is licensed to a rival that takes final-product business away from the licensor. n89 Standard economic analysis tells us that this is the way access to IP would be priced in a perfectly competitive market and that it is a proper

way to price: the price should equal marginal (incremental) cost including marginal (incremental) opportunity cost--so that, at least at first, this result should not be surprising. n90

n89 Because we assume here that final products produced by the IP owner and by rivals are perfect substitutes, sales of final product by rivals will displace unit for unit sales by the IP owner. Note that the relevant opportunity cost here is *average* profit forgone--the total profit forgone by the IP holder as a result of the transaction, per unit of final product sold. It is not the *marginal* opportunity cost, which is likely to be zero because a profit-maximizing IP holder that produces the final product in which the innovation in question is used will produce the quantity of final product at which marginal profit falls to zero.

n90 The opportunity cost element of this result is the focus of current debate over use of ECPR in the regulation of firms deemed to possess monopoly power. *See, e.g.,* Ingo Vogelsang, *Price Regulation of Access to Telecommunications Networks*, 41 J. ECON. LIT. 830, 834 (2003). The problem is that a bottleneck owner is, by definition of a bottleneck, a monopolist, and its final product price may, therefore, be set at a level that yields monopoly profits. These monopoly profits are among the profits forgone as a result of a lost sale of final product. Consequently, they constitute a part of the opportunity cost for which, according to (2) (at least without further modification of the ECPR regime), the bottleneck owner should be compensated when it sells bottleneck input to a rival. But what constitutes monopoly profit in the case of bottleneck inputs is normally to be interpreted as an incentive for innovation protected by the intellectual property laws in the case where the bottleneck is IP that is constituted by an innovation.

The remaining task is to prove the following proposition:

The "Level-Playing-Field" Theorem. The parity or ECPR price given by (1) or (2) for use of a bottleneck input, such as a legally protected innovation, is both necessary and sufficient in order for the "playing field" to be level. We define a level playing field as conditions that allow the maximum difference between the remunerative prices of the perfect-substitute final-products of the two firms, the IP owner (I) and its final product competitor (C), to be exactly equal to any differences in the firms' remaining incremental costs (other than the license fees).

Proof: The level playing field is defined by

$$(3) \min P[f,c] - P[f,i] = IC[r,c] - IC[r,i].$$

That is, the lowest compensatory price the competitor can afford to charge for the final product should differ from the IP owner's by exactly the amount (positive or negative) that the competitor's remaining costs are below the IP owner's. But the lowest price that is financially viable for the competitor clearly is given by

$$(4) \min P[f,c] = P[i] + IC[r,c].$$

The competitor's price must cover the IP licensing cost plus its costs of all other inputs used to supply the final product (which of course includes the cost of the required capital, made up of economic depreciation and a normal competitive return on that capital).

Comparing these two equations, we see at once that the level playing field condition (3) will be satisfied if, and only if,

$$(5) P[i] = P[f,i] - IC[r,i].$$

But this is the parity-pricing formula (1). Thus, parity pricing is both necessary and sufficient for a level playing field. Q.E.D.

The parity-pricing formula (1 or 5) is also identical to the opportunity-cost variant of the rule, (2), because when

final products are perfect substitutes, by definition,

(6) $P[f,i] = IC[i] + IC[r,i] + I$'s profit per unit of final-product output, or, by (5),

(7) $P[i] = P[f,i] - IC[r,i] = IC[i] + I$'s profit per unit of final-product output.

This is the parity-pricing formula (2).

This completes the proof that parity pricing of an IP license is a necessary and sufficient condition for a competitively neutral license fee that satisfies the nondiscrimination component of a RAND commitment. It also follows that ECPR is necessary for economic efficiency in the provision of a final product by competing suppliers. If this rule is violated, a less efficient supplier of the remaining inputs can win the competition for the business of supplying those inputs from a more efficient rival. Violation of (1) or (2) permits a less efficient supplier of non-bottleneck inputs to underprice its more efficient competitors. The proof is readily extended to cases with three or more competing firms.

The final conclusion from all this is that, whatever the procedures and circumstances attending the licensing of IP, whether on the basis of an individual license or cross-license, or via a formalized patent pool,ⁿ⁹¹ or some other means, compliance with ECPR is a sufficient basis for the license fees in question to be deemed to satisfy the nondiscrimination component of a RAND stipulation when the licensor participates in the downstream market.

ⁿ⁹¹ In some cases, practice of a standard may require access to a pool of rights. To the extent that downstream competitors are members of the pool and use the pooled rights in such competition, ECPR requires that those pooled rights be licensed at a royalty rate derived by reference to the member with the lowest incremental cost of remaining (non-pool-IP) inputs. In some instances, however, pool members are granted the use of pool rights on a royalty-free basis. See Josh Lerner, Marcin Strojwas & Jean Tirole, Cooperative Marketing Agreements Between Competitors: Evidence from Patent Pools (Harvard Bus. Sch. Negotiations, Orgs., and Mkts. Research Paper No. 03-25, Apr. 27, 2003). While it may sometimes seem appropriate for IP holders faced by mutually blocking IP rights to agree to mutual forgiveness of license fees (via cross-licensing, patent pooling, or the like) on the assumption that the amounts that the participants owe to one another will approximately cancel one another out, free access to IP is incompatible with ECPR and economic efficiency because with a zero *marginal* access cost too large a share of the use of the IP will tend to be allocated by the market to the pool members. We discuss the general issue of royalty-free licensing further in Part III.H below.

D. ECPR AND DIFFERENTIAL PRICING OF FINAL PRODUCTS

ECPR formula (1) may be used to determine nondiscriminatory licensing fees even when the licensor does not set a uniform price for final products that use the pertinent IP as an input. The formula may even be used when the licensor's price for the final product is cross-subsidized by other items in the product line of the licensing firm.

In such cases, nondiscriminatory license fees must be derived by strictly applying the basic ECPR formula (1). The licensor's implicit payment to itself for IP varies when it sells the final product at varying prices. The licensor's implicit payment to itself also may vary when it uses its IP as an input to different final products. In such cases, the nondiscriminatory, ECPR license fee must similarly vary. In particular, ECPR requires the price charged by the bottleneck owner to vary with the use to which a competitor puts the IP. Specifically, if the license fee is X dollars per unit sold of a relevant final product in any submarket where the licensor offers the final product at a price of \$ 50 per unit, then ECPR requires the license fee to fall to $X - \$ 4$ on sales in any final product segment where the licensor offers a price of \$ 46. That is precisely what the ECPR competitive neutrality formula (1) tells us. Then, all things equal, the license fee must vary from one use of IP to another precisely by the amount that the corresponding final product prices vary. To take another case, assume the IP is used for two different final products. If the incremental costs of the other required inputs is the same for the two products, but the price of one product is \$ 0.2 more than the other, the

competitively neutral license fee for the two uses must also differ by exactly \$ 0.2. n92 That is, *any discrimination in the IP owner's final product prices must be mirrored precisely in its IP license fees. That is exactly what formula (1) implies.*

n92 It follows from (1) that if final-product *J* is the recipient of a cross-subsidy and is therefore priced below incremental cost (its profit yield to the bottleneck owner is negative), then the competitively neutral license fee for IP to be used in the production of *J* must also be less than the incremental cost of supplying the bottleneck service for the purpose. Though this result may be surprising, its logic is straightforward. Cross-subsidy of final products by the IP owner means that in order for rivals to compete effectively with the IP owner, replication of this cross-subsidy must be available to them in some way. If the IP owner sells product *J* to consumers at a price below cost, then it must provide its rivals with IP access at a price that does not cover cost as well. In other words, if product *J* is the recipient of a cross-subsidy when sold by the IP proprietor, then competitive neutrality requires that the same cross subsidy be made available to rival suppliers of *J* through the license fee, as was just explained. This conclusion, however, likely has limited application if any outside of regulated industries.

There is an important consequence of this last result. In some cases where differential pricing is practiced, perhaps most often by regulated firms, only selective, cream-skimming, competitive entry may occur. In these cases entrants can profitably serve only those customers who face the prices that are highest relative to costs, and the consequence is that the incumbent is left without rivals in the supply to customers offered prices that are low relative to costs. But with the differential ECPR access costs just described, the return to entrants will be exactly the same, no matter which customers they serve. The lower returns provided by customers whose prices are relatively low will be precisely compensated for and offset by the lower access charges they are required to pay in an ECPR regime when they serve those customers. It follows that ECPR eliminates the incentives for cream skimming and opens all final product markets equally to efficient entrants.

E. SOME IMPLICATIONS OF AN ECPR LICENSE FEE

Several consequences follow from such an ECPR license-fee arrangement.

(a) *Linking of the License Fee to the IP Owner's Final-Product Price.* If entry or other competitive developments force down the price of a final product with an IP input, other things being equal, the ECPR license fee (on a per-unit basis) must be reduced by exactly the same amount. n93

n93 Rey and Tirole have questioned the effectiveness of ECPR, and have concluded that it "may not preclude or impose any constraint on foreclosure." Patrick Rey & Jean Tirole, A Primer on Foreclosure (Feb. 21, 1997) (unpublished manuscript, available at <http://www.ftc.gov/opp/intellect/020522reydoc.pdf>). In Rey and Tirole's game-theoretic model, the bottleneck input-owner seeks to avoid the loss of monopoly power that may result when prospective purchasers of access who are quoted high license fees fear that later purchasers will be offered lower license fees and so the former are driven not to accept the access owner's price offer. The IP owner in the model preserves its monopoly power by forward integration, in effect becoming its own IP customer. This is supposed to solve the assumed price-commitment problem posed by the IP owner's postulated inability to forswear credibly opportunistic later reductions in input prices and it thereby successfully restores its bottleneck market power. Rey and Tirole conclude, however, that ECPR does not prevent the input-owner from achieving this restorative solution. It is questionable, however, whether the commitment problem that is the underpinning of the Rey and Tirole analysis is a significant real-world phenomenon. For one thing, as Rey and Tirole themselves note, nondiscrimination laws, such as the Robinson-Patman Act can by themselves serve to eliminate the prospect of opportunism and "solve" the would-be bottleneck monopolist's commitment problem (although concededly the Act does not apply to pure licensing transactions, *see supra* note 81). Contractual

nondiscrimination clauses (or other putatively enforceable private commitments, such as the RAND obligation itself) may also serve the same purpose. *See, e.g.,* Leslie M. Marx & Greg Shaffer, *Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity and Uniformity: Comment*, 94 AM. ECON. REV. 796 (2004). Additionally, the innovation activity of large business firms is very much a repeated game in which a firm can demonstrate its commitment to nondiscriminatory licensing through its past behavior. In any event, we disagree with Rey and Tirole on the key issue for our purposes, i.e., that ECPR does not prevent exclusion of efficient entrants by a forward-integrating input monopolist. To the contrary, it can be shown that a rival who is exactly as efficient as the IP owner will always earn exactly zero economic profit, i.e., competitive profit, if charged the ECPR license fee and final-product price is the same for all suppliers. Moreover, because ECPR covers opportunity cost per unit of output, it preserves the IP owner's profit when access is granted. Thus, ECPR does not permit foreclosure of entry because it keeps the access fee from remaining unchanged as envisaged in the Rey-Tirole scenario, and keeps the fee at a level that does not prevent access. The IP owner is generally assured of total net earnings at least as large as under its monopoly, even though ECPR permits the survival of every efficient entrant. (Proof available from authors.) Finally, the contention implicit in the Rey and Tirole discussion that ECPR does not curb undesirable monopoly power is addressed in Part III.I below.

(b) *Full Compensation of the Licensor: The Principle of Indifference.* With ECPR license fees, the IP owner will be *indifferent*, so far as profits are concerned, between using its own IP to provide a unit of final product and allowing downstream competitors to use its IP to produce a unit of final product. The pricing formula both ensures competitive neutrality and guarantees that the IP owner will obtain exactly the same profit whichever of the two courses is taken. A license fee set in accord with formula (1) will yield the IP owner exactly the same profit from *each unit of each* product sold by a rival as the IP owner would earn by using its IP to supply that unit of the final product itself. This can be seen from equation (7). We will see presently, however, that the indifference principle, as described so far, is somewhat misleading. If sales by licensees that pay the ECPR fee expand total final product sales beyond the level possible for the IP owner acting alone, the IP owner will earn more profits than if it alone produced final goods with the IP. n94

n94 However, there is a possible exception to this conclusion. Even though at the ECPR price the IP proprietor will have no reason to care whether its firm or a competitor's produces a unit of the final product, it will not welcome downstream entry if it is so substantial that it reduces the final product price sufficiently to cut into the IP owner's profits.

F. RELATIONSHIP BETWEEN THE ECPR ROYALTY RATE AND THE "REASONABLE" ROYALTY

In Part II we showed that an auction-like process at the time of standard selection was likely to yield a "reasonable" royalty rate. Here the question is the relationship between an ECPR-determined license fee and such a "reasonable" royalty rate. As we will explain below, the two will normally be the same.

Consider first the case of an IP owner facing little if any competition from alternative technologies (for purposes of a given proposed standard), i.e., an IP holder with *ex ante* bottleneck monopoly power. No proprietor of such bottleneck IP will be willing to offer access at arm's length if the license price does not compensate that proprietor fully for any direct licensing costs as well as any opportunity costs (lost profits) incurred as a result of the transaction, an amount (as we have seen) that defines the ECPR price per ECPR formula (2) and that equals $P[f,i] - IC[r,i]$ per ECPR formula (1). In other words, the "reasonable" royalty in such a case will not be less than the ECPR-determined license fee. But the "reasonable" royalty in such a case also is unlikely to exceed the ECPR level. To see this, note that a given prospective licensee will be unable to afford access unless the royalty rate permits it to produce without losing money downstream, which will be the case only if the royalty is set at a level that is less than or equal to $P[f,c] - IC[r,c]$. If we assume that final prices are uniform across downstream producers n95 (so that $P[f,c] = P[f,i]$) and that all such producers are equally efficient n96 (so that $IC[r,c] = IC[r,i]$), then the "reasonable" royalty in such a market cannot exceed $P[f,i] - IC[r,i]$. Thus, the "reasonable" royalty that will emerge in such a licensing market can only be the ECPR-determined license fee. n97

n95 This assumption does not imply the absence of discriminatory final pricing--merely that any price discrimination is identical across all producers.

n96 The assumption of equal efficiency does not significantly undermine the generality of our conclusions. Under the alternative assumption that the IP holder is materially more efficient than its downstream rivals no licensing would take place in any event as the rivals would be unable to compensate the licensor for its lost profits on downstream production. Conversely, if we were to assume that the IP holder is materially less efficient, there would be no rational (legitimate) incentive for the licensor to produce the final product.

n97 While such a licensing market is admittedly not competitive (by hypothesis), the foregoing discussion demonstrates that if the downstream price is sufficiently low the ensuing royalty will equal the royalty that would prevail in a fully "competitive" licensing market. This is merely an illustration of the well-recognized proposition that (the exercise of) market power over IP can be constrained by competition in downstream product markets. *See* DOJ-FTC Intellectual Property Guidelines, *supra* note 2, § 3.2.2 & n.18 (technology market may include not just substitute technologies but also goods that are substitutes for goods that are produced with the licensed intellectual property). It is equivalently an illustration of the point we have already noted (and will elaborate further in Part III.I, *infra*) that elimination of any excessive final-product price will immediately and automatically reduce the ECPR royalty correspondingly. While our discussion in this section is focused on the time of standard selection, it is a possibility that market power downstream may increase after selection of the technology as a standard. In that case, the IP-owner would increase both its final-good price and its royalty, unless constrained; the higher post-selection royalty could still satisfy ECPR using the higher post-selection final-good price, but would no longer be "reasonable" as judged at the time of standard selection.

Next consider the case where there is ample *ex ante* competition in the IP licensing market. In such a scenario, no technology owner has bottleneck market power either *ex ante* or *ex post* (at least if the technology owner is effectively constrained *ex post* by pre-selection commitments). When any such technology owner contemplates before selection the royalty at which it is willing to commit to license its IP to rivals, there is no opportunity cost in the form of lost downstream profits. Because there are good technology alternatives, a policy of withholding IP from rivals will not divert final-product business from them--it will merely lead them to veto the selection of the owner's technology as a standard. Thus, in the case of *ex ante* IP competition, ECPR formula (2) becomes:

$$(8) P[i] = IC[i] + \text{the IP owner's incremental opportunity cost of licensing to others} = IC[i] + O = IC[i].$$

This merely confirms that the royalty will be set equal to the (appropriately defined) incremental cost of licensing, which is what we would expect of a "reasonable" royalty under highly competitive conditions. n98

n98 *See supra* Part II.C.2.

In a competitive licensing market where no party possesses bottleneck power over access to technology, one might not expect ECPR formula (1) to remain valid and to define a "reasonable" royalty rate. That is, when access to a particular piece of IP is not necessary to produce the final product--as when there are multiple competing types of IP suitable to the task--there is no reason to assume that the IP owner has any legitimate claim on any residual profits that downstream sellers obtain via a supracompetitive final product price, $P[f,i] - P[f,i]^* > 0$, where $P[f,i]^*$ is the competitive downstream price. Then one might think that formula (1) would grant the IP owner profit on the licensed IP to which it apparently has no legitimate claim:

$$P[i] = P[f,i] - IC[r,i] \text{ [license price = the IP owner's final-product price -- the IP owner's incremental cost of remaining inputs.]}$$

There is an important category of cases, however, where ECPR formula (1) remains valid even in the absence of

bottleneck market power. If we assume that competition results in formula (2) applying in the form of equation (8), we find that $P[f,i] - IC[r,i] = IC[i]$, ($= P[i]$) which by rearrangement yields $P[f,i] = IC[r,i] + IC[i]$. In other words, when both formulas (1) and (2) hold true in a competitive scenario, it must also be true that the final-product price is not supracompetitive--rather, it will be equal to the sum of the incremental cost of all inputs. Such an outcome is likely, for example, when there are no barriers to entry downstream and vigorous *ex ante* competition in the licensing market.

Indeed, the foregoing demonstrates that license fees established by an auction-like process at the time of standard selection that satisfy ECPR formulas (1) and (2) also will be "reasonable" royalties when downstream barriers to entry are low *regardless of competitive conditions in the technology licensing market*.ⁿ⁹⁹ To see why, suppose first that an IP holder proposes to license at a royalty rate that exceeds the ECPR level of $P[f,i] - IC[r,i]$.ⁿ¹⁰⁰ Such a royalty would plainly not be accepted by any equally efficient licensees (and hence could not be "reasonable") as it would require production of the final product at a loss. Suppose instead that an IP holder proposes to license at a royalty rate *less* than the ECPR level, yielding excess profits to downstream production. In such a case, absent high downstream entry barriers, entry by new producers attracted by the supracompetitive profits will force down the final-product price until the excess profits are gone. At that point, the "reasonable" royalty and the ECPR-determined royalty will be the same.
n101

n99 Of course, low entry barriers would imply access to IP rights necessary for downstream production. The general availability of licenses for necessary IP under a RAND commitment would suffice, though the royalty level will still depend on the amount of *ex ante* competition in the licensing market.

n100 For convenience we again assume uniform pricing and equal efficiency downstream.

n101 If we relax our assumption of equal efficiency, in the case of an *ex ante* competitive licensing market, a more efficient IP holder (where $IC[r,i] < IC[r,c]$) will still lack the bottleneck market power to collect a fee that is higher than the market-driven "reasonable" royalty level. Alternatively, if we assume that $IC[r,i] > IC[r,c]$, there would be no rational reason (whether legitimate or anticompetitive) for the IP holder to produce the final product and the ECPR-determined fee would be irrelevant.

G. ECPR AND EFFICIENT ALLOCATION OF INNOVATION USE AMONG FINAL-PRODUCT PRODUCERS

The implications for economic efficiency of an ECPR license fee depend on how it affects the interfirm allocation of production tasks in markets where the IP is an input. When both the patent holder and rivals use the IP to produce competing final goods, what share of that final output should be produced by each of these firms? Or, if that output will be produced by only a single firm, which of the firms should get the job?

Clearly, the royalty rate will influence the allocation of the task between innovator and licensee. The lower the fee, the more of the final product we can expect the licensees to supply, because lowering the license fee reduces their production cost. If license fees are negotiated individually and differ among licensees, the allocation of final-output production among those firms will also be affected. A socially optimal set of fees is one that permits efficient allocation of the task of final-product supply among the competing providers. Specifically, the most efficient producers of final product should be assigned that task by the market, whether that efficient producer is the IP proprietor, one (or several) of its horizontal rivals, or some combination of those firms.

But that is evidently what ECPR does. The Level-Playing-Field Theorem shows that only rivals who can produce at least as efficiently as the IP owner will be able to afford the ECPR license fee (and earn profits after paying that fee). A less efficient rival who has to pay the ECPR licensee fee and compete with the IP owner's final product price will not be profitable and will be forced from the market. On the other hand, rivals that are more efficient at final-product supply than the IP owner will be able to pay the ECPR license fee and still profitably underprice the IP owner's final product.

In sum, ECPR pricing will *automatically* give shares in the final-product market to the firms that are its most efficient suppliers. In the extreme case, the end result may even be an equilibrium with complete specialization, with the other market at issue--that for innovation--dominated by the IP supplier (assuming that it is the most efficient supplier of R&D), while licensees who are more efficient at providing final product become the principal suppliers of the final products.

H. ROYALTY-FREE LICENSING AND ECPR

In practice, technology sometimes appears to be traded "for free," with Firms X and Y each permitting the other to use its IP without running royalties. Such "royalty-free" licensing is occasionally required by standard-setting organizations, particularly in the Internet standard-setting arena. n102 These types of de facto or de jure cross-licensing or pooling arrangements are one means by which companies resolve blocking patent (or other IP) positions among themselves. n103 One common justification offered for this approach is the standard (and static) textbook view that licensing is effectively costless, a view to which we have already taken serious exception. Another is that zero prices save record-keeping and administrative costs, without affecting anything else, whenever the royalties firms otherwise would pay each other would balance out in the long run. n104 Elimination of the license fee in such cases seems equitable and efficient. But this argument ignores the inefficiency induced by a zero price for use of an item whose user cost is not zero.

n102 See Lemley, *supra* note 7, at 1906; Patterson, *supra* note 12, at 1053 n.39.

n103 See Shapiro, *supra* note 9, at 129-30 (noting that while such cross licenses "involve no running royalties, . . . they may involve balancing payments at the outset to reflect differences in the strength of the two companies' patent portfolios as reflected in a patent pageant, and/or the vulnerability of each to an infringement action by the other").

n104 In the typical standard-setting context, however, only a limited number of firms (if any) will possess the kind of broad IP portfolios generally thought to be a traditional condition for "royalty-free" cross-licensing or pooling.

To make the point more concrete, suppose that both firms produce two items, A and B, with the former product using as an input IP_x, supplied by firm X and the latter using IP_y, supplied by firm Y. Suppose, moreover, that use of either input by either firm has some cost to the provider. Then its supply at a zero price will not only lead to overuse by the licensees, but also to misallocation of the task of producing A and B.

A zero price means that Firm Y can increase its use of Firm X's IP without additional cost to itself--its marginal cost of such added IP use is zero. This gives Y a clear incentive to add to its output of the final product, A, that uses X's IP beyond the efficient quantity that it would have supplied if it were charged the ECPR license fee. Similarly, Firm X will be given the incentive to overproduce the other final product, B, that employs Y's IP. In an extreme case, Firm X may displace Y as producer of B even though it is the less efficient producer of that item, while the reverse may occur in the production of A. n105 Such misallocations contrast with the consequences of an ECPR licensee fee, which assigns the tasks of innovation and final product supply to the firms that can carry them out most efficiently

n105 An analogy brings out the problem more clearly. Consider two rival restaurant owners who frequently dine in one another's establishments. If they agree to waive the charges to one another, each will, in effect, be dining at an "eat all you want" buffet. Will this not induce obesity of both proprietors?

For these reasons, the practice by some SSOs of requiring royalty-free licensing is troubling, although we acknowledge, as Shapiro puts it, that "*any* cross license is superior to a world in which . . . patent holders [with mutually blocking positions] fail to cooperate, since neither could proceed with actual production and sale in that world without

infringing on the other's patents." n106 If anything, the incidence of "royalty-free" cross-licensing or pooling scenarios seems to be diminishing outside the standard-setting arena in many, if not most, industries. n107 Moreover, such licenses actually may not be royalty-free in the economic sense. For instance, periodic adjustments to technology-trading agreements may be anticipated in connection with ongoing relationships (involving balancing payments in cash or via the contribution of additional innovations to the deal) that implicitly amount to the (net) payment of positive running royalties (to the extent that one party in reality ends up making greater use of the traded IP than the other).

n106 Shapiro, *supra* note 9, at 123.

n107 See, e.g., ASHISH ARORA, ANDREA FOSFURI & ALFONSO GAMBARDELLA, *MARKETS FOR TECHNOLOGY* 80, 178 (2001) ("Although traditionally cross-licensing arrangements have been royalty-free, in the last ten or fifteen years, firms with stronger and larger patent portfolios have been demanding and receiving royalty payments." "Whereas initially the cross-licensing arrangements were essentially barter trades, in that technology was exchanged for technology, recent arrangements appear to involve significant monetary transfers as well, from companies with weak patent portfolios to those that hold critical patents or those with more substantial portfolios."); John H. Barton, *Antitrust Treatment of Oligopolies with Mutually Blocking Patent Portfolios*, 69 *ANTITRUST L.J.* 851, 855 (2001).

I. MONOPOLY PROFIT

It has often been argued that a major deficiency of ECPR is that, by itself, it is incapable of eliminating or reducing any illegitimate monopoly profit. Indeed, as the contestable markets model shows, such excess profit can be eliminated only if ECPR is accompanied by an appropriate cap on final-product price. n108 ECPR merely transmits such undesirable attributes of the final-product price to the license fee. This means that, by the nature of its construction, an ECPR license fee can yield excessive profits if and only if the final-product price does so. That is a direct implication of the Level-Playing-Field Theorem and its derivation.

n108 The pertinent analysis also suggests that under regulation the price cap should be set at the level of the stand-alone cost of the item in question, that is, at the level of price such that any further increase would be unsustainable if the market in question were competitive because entry would thereby be attracted.

This, of course, is in general not relevant for license fees for patented IP under rules that are designed to offer the opportunity to reap "temporary monopoly profits" as an incentive for innovative activity. The fact that the law does not make licensing compulsory indicates that such returns are normally presumed not to be excessive. n109 Where there do happen to be particular reasons to consider the final-product prices excessive, however, the appropriate remedy is surely not a distortion of the terms on which IP is made accessible to competing licensees.

n109 See Patterson, *supra* note 12, at 1052 ("U.S. patent law does not explicitly provide for compulsory licensing."). Cf. *Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 407-08 (2004) ("Firms may acquire monopoly power by establishing an infrastructure that renders them uniquely suited to serve their customers. Compelling such firms to share the source of their advantage is in some tension with the underlying purpose of antitrust law, since it may lessen the incentive for the monopolist, the rival, or both to invest in those economically beneficial facilities.").

In the standard-setting context, an IP holder is likely to earn a supra-competitive return only (i) when it possesses market power *ex ante*; or lacking *ex ante* power (ii) when it nonetheless obtains and exercises market power post-selection because either (a) SSOs and private actors did not adopt appropriate measures to constrain such power, or (b) SSOs and private actors adopted appropriate measures but the IP holder breached such restrictions. We believe that

ECPR is applicable to RAND analysis in each of these cases (though the presumptive remedy in case (ii)(b) is to require compliance with the breached restrictions), and the fact that ECPR (alone) may not suffice to deprive the IP holder of supranormal returns in such cases should not offend antitrust or IP policy. This is clearest in case (i), where there are no significant substitutes for the innovation the IP holder has created. n110 Even in case (ii)(a), at least when there has been no fraud or misrepresentation, one might question whether there is a strong policy rationale for depriving the IP holder of the return to innovation accruing to the position that market participants have negligently thrust upon it.

n110 *See, e.g., Image Technical Servs., Inc. v. Eastman Kodak Co.*, 125 F.3d 1195, 1224-27 (9th Cir. 1997) (recognizing right of IP holder to earn even monopoly returns on IP and therefore omitting from remedial injunction in § 2 case any provision requiring licensing at "reasonable prices" while still maintaining duty to avoid discrimination against downstream rivals).

The bottom line is that ECPR is still relevant in such cases in helping to deter the extension of monopoly power from IP licensing markets into downstream markets, but it neither eliminates nor facilitates monopoly profits in the licensing market itself. It is not an instrument designed for that purpose. Excessive pricing for IP originates from a lack of (or failure to capitalize on) *ex ante* competition in the IP market, which, in turn, may be aggravated by any lack of competition in downstream markets. Other means are required to limit the exercise of monopoly power in the licensing or final-product markets that leads to socially excessive overcharges. Such means may include SSO auctions and RAND stipulations that yield *ex ante* competitive royalties and (when *ex post* licensing market power arises for whatever reason) the regulatory elimination of any excessive final-product price (which, as we have previously noted, will immediately and automatically reduce the ECPR royalty correspondingly). The fact that ECPR alone does not eliminate monopoly profit or monopoly power is no more to its discredit than the fact that it does not help to cure cancer or baldness or solve any other problems it was not designed to remedy.

J. ECPR WHERE DOWNSTREAM COMPETITORS PROVIDE IMPERFECT SUBSTITUTES

In discussing the attributes of ECPR we have assumed up to this point that downstream rivals of the licensor supply products that are perfect substitutes for the licensor's. This leads to the presumption that every x-unit in increased sales by a rival will reduce the licensor's final-product sales quantity by precisely x units. This, in turn, underlies the mathematically derived conclusion that the ECPR price precisely covers the licensor's opportunity cost resulting from licensing, that is, the profit that the licensor forgoes as a result.

But what if a rival's product is an imperfect substitute for the IP owner's final product, so that an x-unit expansion of final product sales by the licensee only cuts the licensor's sales by, say, 0.6x? Then the opportunity cost incurred in the licensing process is also correspondingly lower--only 60 percent of the profit of x units of sale by the licensor. Competitive neutrality then calls for the license fee to be reduced similarly. In such cases, the license fee should be set according to formula (2), where the opportunity-cost component is now 40 percent lower than the IP owner's profit per unit of final-product output. n111 This lower fee will provide compensation sufficient to ensure that permitting others to use its IP to produce competing final goods will not reduce the licensor's earnings. n112 Of course, at a certain point, administrability concerns (and legal principles of relevant market definition) suggest that a sufficiently imperfect substitute be deemed no competition at all, relieving the IP holder of RAND nondiscrimination obligations, at least for that particular use. n113

n111 While royalties under this approach will be literally discriminatory, they will nonetheless be competitively neutral. It should be noted that in the case of imperfect-substitute final products it is not so easy to provide a level playing field theorem because it is difficult in that state of affairs to define a "level playing field." While earlier, with identical products, we had shown that formulas (1) and (2) are equivalent, here we are taking the position that (2) provides more appropriate guidance.

n112 Armstrong has proposed a similar generalization of the ECPR rule, showing that this is necessary for

preservation of the efficiency properties of the approach. See Mark Armstrong, *The Theory of Access Pricing and Interconnection*, in 1 HANDBOOK OF TELECOMMUNICATIONS ECONOMICS 295-384 (Martin E. Cave et al. eds., 2002).

n113 Recall that we have argued *supra* in Part III.A that the RAND nondiscrimination commitment should be held inapplicable to the extent that IP holders are not in competition with their licensees.

It is straightforward to demonstrate the theoretical optimality properties of our modified ECPR rule. We need only remind ourselves of the standard result of economic analysis that shows the economic optimality (economic efficiency) of the prices that emerge in any (theoretical) market that is perfectly competitive (the Arrow-Debreu theorem). n114 The license fee just described is precisely the price that would be charged in a perfectly competitive market for licenses--one in which there existed a large number of perfectly substitutable IP solutions competing with one another for licensee customers. That is, the price would exactly equal any incremental cost entailed in provision of the license, plus any actual opportunity cost entailed in the grant of such a license. n115 It follows that the calculation of the ECPR license fee should be modified in the manner just described and that this generalized ECPR fee, even if more difficult to calculate and monitor in practice, will offer all of the advantages of ECPR already described.

n114 Kenneth J. Arrow, *An Extension of the Basic Theorem of Classical Welfare Economics*, in PROCEEDINGS OF THE SECOND BERKELEY SYMPOSIUM ON MATHEMATICAL STATISTICS AND PROBABILITY (1951); GERARD DEBREU, *THEORY OF VALUE* (1959). The exception to this fundamental result is the case where externalities interfere with the workings of the market mechanism.

n115 An analogy will show why this is so. Consider a piece of real estate that a prospective shopkeeper wants to rent, to open up in competition with a nearby shop that is also owned by the prospective lessor. If many competing landlords were in a similar position, it is evident that none of them would rent their property unless the rental fee covered the direct cost plus the actual opportunity cost, but competition would prevent them from charging more than this.

IV. VOLUNTARY LICENSING AND INCENTIVES TO PARTICIPATE IN STANDARD SETTING

The licensing of IP can promote the rapid dissemination and adoption of new processes and new products, which, in turn, can promote both economic growth and competitive markets. This may appear to make mandatory licensing an attractive option. The courts, however, have been reluctant to move in that direction. One good reason for this reluctance would be a desire to avoid measures that risk expropriating assets of the IP owner that were legitimately acquired and retained. While there may be no basis on which to argue that the result is even approximately optimal, here as elsewhere market forces are able to deal effectively with much of the problem. The fact is that voluntary licensing is widespread in practice and appears to be expanding. n116

n116 See BAUMOL, *supra* note 65, ch. 6. It should be clear that if the price is right it will pay an IP proprietor to license, and to do so voluntarily. If it can earn \$ 25 per widget it is able to produce with the aid of its IP and a rival offers it a license fee of \$ 30 per widget that the latter supplies, clearly the IP holder can benefit by licensing even if the licensee's sale of a widget displaces a widget sale of its own. There are many other reasons for voluntary licensing, of course. One of the reasons for voluntary technology sharing that is particularly pertinent to the role of standard setting is the problem of "blocking" IP (including "patent thickets") and the widespread IP pooling and cross-licensing efforts that have arisen to deal with such problems.

In any event, there is little question that the law generally does not compel IP holders to license their innovations on "reasonable" terms or even to license them at all. n117 This is well illustrated by the case of unanticipated "submarine" patents facilitated by the provisions of patent law that permit patent applications to remain confidential for a period of time. n118 "The basic scenario is that a patent applicant allows its application to languish in the PTO while watching

another company make substantial investments in a technology or product that will infringe the yet-to-be-issued patent. Once the other company's sunk costs are large, the patent applicant obtains the patent, asserts infringement, and 'holds up' the other company, demanding supracompetitive royalties for a license to the 'submarine patent.' The company must agree to supracompetitive royalties or forego its production or innovation." n119 Submarine patents were a particularly significant risk in the period when patent applications were not published prior to issuance; in 1999, however, Congress amended the patent laws to require that most applications be published 18 months after filing. n120 Of course, the absence of mandatory licensing means that a hold-up phenomenon can also arise if a company sinks infringing investments while ignorant (for whatever reason) of a published patent application n121 or an issued patent.

n117 See, e.g., HOVENKAMP, JANIS & LEMLEY, *supra* note 17, § 6.5c at 6-40 ("As a general proposition the American intellectual property laws do not require the IP holder to license."); *Dawson Chem. Co. v. Rohm & Haas Co.*, 448 U.S. 176, 215 (1980) (compulsory licensing "is a rarity in our patent system").

n118 See FTC PATENT REPORT, *supra* note 10, ch. V(II)(B).

n119 *Id.*, ch. I(III)(A)(2)(a)(i); see also *id.*, ch. IV(II)(C)(1)(a).

n120 Under the 1999 amendments, applications filed only in the United States need not be published but all other applications (in practice, the great majority) must be published within 18 months of filing. See 35 U.S.C. § 122(b)(1); FTC PATENT REPORT, *supra* note 10, ch. IV(II)(C)(1)(a).

n121 It is possible for a patent stating broader claims to be issued after publication of a more limited application through the claim amendment process. See FTC PATENT REPORT, *supra* note 10, ch. IV(II)(C)(1).

This lack of mandatory licensing obligations creates an asymmetry between participants and non-participants in standard-setting activities. RAND obligations that flow from membership in SSOs or from participation in standard-setting exercises carried out under their auspices generally do not bind or limit those who elect to remain entirely outside the formal standard-setting process. n122 A decision against participation thus preserves an innovator's legally unfettered independence in licensing decisions, permitting it to assert its patents against (and hold up) those who cannot carry out a given standard without infringement.

n122 See, e.g., *Rambus, Inc. v. Infineon Techs. AG*, 318 F.3d 1081, 1105 (Fed. Cir. 2002) (affirming judgment as a matter of law overturning jury verdict against patent holder in case of alleged nondisclosure to SSO on ground that patent holder withdrew from SSO before formal standard consideration commenced and before any duty to disclose otherwise arose), *cert. denied*, 540 U.S. 874 (2003).

Some have argued that this "asymmetric situation provides an incentive for firms *not* to participate in the standards-setting process." n123 We conclude, however, that mandatory RAND licensing under the model we have offered in this article is unlikely to deter a significant fraction of innovators from participating in standard-setting endeavors. We look at the participation decision for three types of holders of IP.

n123 David J. Teece & Edward F. Sherry, *Standards Setting and Antitrust*, 87 MINN. L. REV. 1913, 1980 (2003).

First, holders of IP whose rights are already *known* in an industry should not benefit from nonparticipation (with the possible exception, discussed below, of holders of monopoly IP). Those setting standards can take known IP rights into account. Indeed, because abstention by a holder of known IP raises the prospect of *ex post* opportunism in the event that its IP is selected as the standard, nonparticipation will tend to make selection less likely. In fact, by joining a standard-setting process and thereby *committing* to charge reasonable and nondiscriminatory royalties the holder of

known IP rights may improve its chance of selection. A simple promise might not be credible without the commitment of becoming an SSO member subject to RAND obligations. n124 Logically, the benefits of being able to make such a credible commitment are greatest for IP holders who face active competition and possess little or no *ex ante* market power (thus presenting the greatest risk of *disparity* between *ex ante* and *ex post* outcomes).

n124 An exception to this rule may exist with regard to IP holders who possess a portfolio of rights and innovative activities that is subject in whole or part to retaliatory blockage by other IP owners. In such a case, the other holdings in the portfolio may serve as "hostages" allowing the nonparticipating member to commit credibly to reasonable and nondiscriminatory licensing. But in such a case, nonparticipation raises no problems or impediments for the standard-setting effort.

Second, few of those holding IP rights that are undisclosed or undiscovered, but that also bestow little or no *ex ante* market power because there are comparably valuable IP alternatives, are likely to remain outside a standard-setting process on the mere hope of holding up SSO members for supracompetitive royalties. n125 An IP owner with little *ex ante* market power faces a number of viable rivals, not all of whom may be counted on (in the absence of unlawful collusion) to refrain from participation. If, as seems logical, the likelihood of selection is enhanced by active participation, an IP owner seems unlikely to improve its prospects materially (and risks earning no return at all on its investments) by remaining outside the standard-selection process. Indeed, if an innovation is truly novel (and thus not known to those skilled in the relevant field), it may be impossible without disclosure and active participation by its proponent to incorporate it into a standard at all (even when the IP, if disclosed, would command significant market power).

n125 Of course, the 1999 patent law amendments requiring early patent publication have reduced the incidence of "submarine" patents in the first instance.

Further, when strong competition for choice as a standard is forcing license fees toward incremental cost, the relative attractiveness of solutions from nonparticipating IP holders that are ostensibly royalty-free will decline. Indeed, the mere fact that some item of technology appears to (or does) bear a zero royalty rate does not necessarily guarantee success. Royalty-free Linux software, for example, has not (at least yet) driven Microsoft from the market for operating systems used by server computers. Royalty-bearing technology can prevail over royalty-free options for several reasons, including the possibility that "royalty-free" technology may require the user to incur costs normally borne largely by the IP licensor, such as costs for training, maintenance, updating, etc. The likelihood that a nondisclosure strategy will succeed is thus significantly diminished to the extent that the technology covered by undisclosed IP rights is inferior to competing technology in terms of operating cost or product quality (i.e., when *ex ante* market power is low). n126

n126 To illustrate this proposition, suppose that the alternative standards under consideration are all perfectly interchangeable *ex ante* and that the corresponding patented technologies vary only in terms of the resulting manufacturing costs for the standardized product. Assume further that use of patent Y results in the lowest manufacturing cost, and that use of patent X results in somewhat higher costs. In a competitive standard selection process, the standard linked to patent Y is likely to be chosen so long as the owner of Y offers a royalty that exceeds the royalty on X by an amount that is slightly less than the difference between the manufacturing costs under patents Y and X. If the apparent royalty on the technology corresponding to X is zero (because of nondisclosure of the patent), then Y will be selected as long as its royalty is just slightly less than the savings in manufacturing costs. Now, if the owner of Y cannot afford to license at such a rate (e.g., because the royalty is less than the incremental cost of licensing), we would not expect to see it offering Y in competition with X in the standard-selection exercise (unless participation is cost-free, an unlikely assumption). That is, when we observe Y being offered in competition with ostensibly royalty-free X at a positive royalty, R, we may rationally conclude (in this hypothetical) that R is less than or equal to the manufacturing cost savings or other benefits of

using Y (and also exceeds the incremental cost of licensing Y).

Third, holders of known or unknown IP that bestows substantial *ex ante* market power (monopoly power, in the antitrust sense) also may not find themselves materially deterred from participating in standard-setting proceedings and assuming RAND obligations. It remains possible, of course, that a holder of monopoly IP might choose to abstain in order to avoid RAND obligations that limit its ability to leverage its power into downstream markets. But much technology involves large amounts of intellectual property owned by many different firms, so a potential opportunist may place little weight on such freedom, recognizing that misbehavior only invites revenge by the proprietors of other essential IP rights who can wield them to block the activities of the hold-out firm. In fact, an IP monopolist may well shun disputes and litigation and place high value on embracing the safe harbor protections putatively offered by adherence to RAND obligations. Most significantly, such an IP holder will not perceive RAND obligations as confiscatory given that (as we have interpreted them in this paper) such obligations permit an *ex ante* monopolist to reap and retain monopoly royalties (which presumably represent an appropriate return on innovation). n127

n127 It might be argued that holders of undisclosed IP possessing some degree of *ex ante* market power--though falling short of monopoly power in the antitrust sense--might abstain from participation to gain the potential payoff from avoiding reasonable royalty RAND obligations. We are not convinced, however, that this scenario presents an empirically significant concern for several reasons. First, most of the potential disadvantages of abstention that we have already canvassed in the "full monopoly" case (e.g., the inability to disclose and "teach" truly novel innovations, the potential vulnerability to reciprocal retaliation, the loss of safe harbor protections) must also be weighed against the royalty payoff from nonparticipation in this scenario. Indeed, that payoff--at most, the extent to which a "full monopoly" royalty would exceed a "reasonable" RAND royalty--is a function of the nature and extent of the competition the IP holder faces in the standard-selection process. The higher the payoff to abstention, the greater the uncertainty and the greater the risk that nonparticipation will result in nonselection because of the existence of competing alternatives. The closer the IP holder is to certainty of selection regardless of participation (i.e., the closer to the "full monopoly" case discussed above), the lower the payoff from abstention. It is possible, of course, that "just so" cases might arise where the likely payoff exceeds the risks (where the IP is just far enough away from monopoly but selection is still just certain enough), but we have seen no evidence from the literature, the case reports, or the record of the DOJ/FTC hearings to suggest that such cases are common occurrences.

Moreover, to the extent that ECPR license fees are mandated under RAND, there is ground for the conclusion that the IP owner may even expect to be better off. We have seen that the parity price provides full compensation to the IP holder for any of its final-product sales that are displaced by that of a licensee. But the licensor stands to gain more than compensation for profits forgone from the loss of sales to a rival. An ECPR price offers market share to more-efficient suppliers, and more-efficient rivals may be able to reduce the final-product price and expand the market. If so, the IP owner will obtain *total* net earnings greater than those it could have gotten if it had refused to license. For the licensor's per-sale return equals L (ECPR license fee = forgone profit per unit of final product provided by the licensee) multiplied by N (number of those products sold by licensees). But if $N > M$, the number of units of final product that would have been sold by the IP holder in the absence of licensing, it follows at once that

IP total profit absent licensing = LM < LN, IP total profit from an ECPR fee.

Thus, wherever there exist final-product producers more efficient than the IP owner the latter stands to gain by licensing, and in any event the IP owner will never lose out under an ECPR license fee. For if licensees are neither more nor less efficient than the IP proprietor, the latter will earn the same whether or not it licenses, while if no prospective licensee is as efficient as the IP owner, no rival will be able to afford the license, as the public interest requires, and so final-product supply will then be left exclusively to its most efficient provider, the IP owner.

The conclusion is that if the participants in the market for IP licensing behave rationally, there will normally be no

reason for compulsory licensing. The market will do its job, here as elsewhere. The market also helps deal with the fundamental dilemma, the apparent incompatibility of rapid dissemination of new and superior IP and the provision of incentives for investment in the innovation process. Voluntary dissemination at fees mutually advantageous to licensor and licensee simultaneously provides the incentive for innovative activity and speeds dissemination and utilization of its output. In economic jargon, ECPR license fees help to internalize the externalities of innovation. In other words, they help the innovator to do well by doing good.

We cannot categorically rule out the possibility of an occasional holder of "stealth" IP electing to treat its property as little more than a lottery ticket by abstaining from SSO activities. If anything, however, the scenario of greater concern has been thought to be the one where an IP holder actively participates in the process and lulls SSO participants into (wrongly) assuming that it has no undisclosed IP. We turn next to a discussion of this scenario and the broader issue of disclosure obligations in standard-setting efforts.

V. IP DISCLOSURE OBLIGATIONS

Disclosure obligations raise a special and critical issue in the realm of standard setting. IP that is necessary for adherence to the selected standards gains a competitive advantage, and perhaps even the power to hold up those who seek to offer standard-compliant products. Unsurprisingly, SSOs typically adopt policies requiring their members to disclose ownership of specified IP rights during standard-setting exercises. n128 In practice, however, such SSO disclosure policies have proven to be controversial, not least because they have frequently been beset by a lack of clarity and precision. n129 The Federal Circuit has opined that "when direct competitors participate in an open standards committee, their work necessitates a written patent policy with clear guidance on . . . what, when, how and to whom the members must disclose." n130

n128 See Lemley, *supra* note 7, at 1904-05, 1957.

n129 See *id.* The Federal Circuit has underscored the disadvantages associated with vague disclosure policies, explaining that: "Just as lack of compliance with a well-defined patent policy would chill participation in open standard-setting bodies, after-the-fact morphing of a vague, loosely defined policy to capture actions not within the actual scope of that policy likewise would chill participation in open standard-setting bodies." *Rambus, Inc. v. Infineon Techs. AG*, 318 F.3d 1081, 1102 & n.10 (Fed. Cir. 2002) (holding that the patent disclosure policy of the Joint Electron Devices Engineering Council, an SSO, was beset by a "staggering lack of defining details"), *cert. denied*, 540 U.S. 874 (2003).

n130 *Id.* at 1102.

At first glance, suitably clear disclosure obligations would seem to be generally in the public interest. Mandatory disclosure provides information that can attract potential licensees and enables them to negotiate licensing terms rationally. Disclosure also can help others who are in a position to invent products or processes that improve on the existing IP. Perhaps most important, disclosure can facilitate and stimulate rapid dissemination of improved technology and replacement of its obsolete predecessors.

Nevertheless, these benefits, however laudable, represent only one side of the coin. They do not account for the cost to IP holders of an SSO compelling them to disclose innovations when they are not (otherwise) legally required to do so. Trade secrets need not be divulged, and such protection, unlike patent protection, has no fixed term. n131 The economic value of trade secret information depends on its not being generally known. Innovators certainly are not legally obligated to divulge anything about their trade secrets, including their assessments of the patent potential of their inventions. Those who apply to patent their IP must disclose their inventions sufficiently so that those skilled in the art can practice the patent without undue experimentation, but the burden remains on third parties to discover the application (after a period of enforced secrecy n132) or the issued patent. Requiring innovators to accept disclosure obligations that exceed those required under the patent laws or that are inimical to trade secret protection is costly not

only in terms of its direct impact on those whose valuable trade secrets are taken but also through its chilling effect of diminishing future incentives to invest in innovation. n133

n131 See DOJ-FTC Intellectual Property Guidelines, *supra* note 2, § 1.0; J. Gregory Sidak, Trade Secrets and the Option Value of Involuntary Exchange (unpublished manuscript, Aug. 2004), available at <http://ssrn.com/abstract=577244>.

n132 As previously noted, patent applications are not published until 18 months after filing. If filed only in the United States, a patent does not become public until issuance. See *supra* note 83.

n133 See Benjamin Chiao, Josh Lerner & Jean Tirole, The Rules of Standard Setting Organizations: An Empirical Analysis 5-6 (Harvard Bus. Sch. Negotiations, Orgs., and Mkts. Research Paper No. 05-05, Feb. 9, 2005) ("In our interviews, firms highlighted several costs associated with the disclosure of information in the standard setting process, even of already-issued patents. In particular, they argued that due to the number and complexity of patent portfolios, rivals frequently could not determine 'the needle in the haystack': that is, which patents were relevant to a given standardization effort. By highlighting the relevant patents or applications, in many cases firms felt they were disclosing valuable information to competitors about the applicability of their patent portfolios and their future technological strategies more generally.") (footnote omitted).

In addition to risking diminution of the rewards to innovation, SSO disclosure policies also can raise antitrust concerns because they might be misused to promote anticompetitive coordination or collusion among rivals. For example, requiring members to disclose unpatented (or uncopyrighted) trade secrets, or future intentions or plans for R&D, patenting, or other innovative activity would be legally suspect. n134 The antitrust laws generally discourage the exchange of competitively sensitive business information on the ground that such collaborations pose an unacceptable risk of facilitating anticompetitive coordination. n135 This risk that competitive disclosures will foster collusion counsels in favor of restricting the scope of mandatory disclosures among competitors; indeed, it has been persuasively argued that this risk warrants limiting SSO disclosure obligations to no more than "essential" IP. n136

n134 *Rambus, 318 F.3d at 1102* (concluding that "a member's intentions to file or amend [patent] applications do not fall within the scope of [the SSO's] disclosure duty," relying in part on the testimony of an SSO witness that "because antitrust laws discourage direct competitors from discussing market-driving innovations, [SSO] members 'were not supposed to reveal their future plans'").

n135 See, e.g., LAWRENCE A. SULLIVAN & WARREN A. GRIMES, THE LAW OF ANTITRUST: AN INTEGRATED HANDBOOK 234 (2000) ("Concerted information programs should be challenged when analysis suggests that they are, on balance, competitively harmful."); *United States v. Container Corp. of Am.*, 393 U.S. 333 (1969).

n136 See, e.g., Lemley, *supra* note 7, at 1959 ("Limiting the scope of the IP rules so that they cover only essential IP will . . . help an SSO avoid antitrust scrutiny. In the analogous context of patent pools, the DOJ has looked more favorably upon patent pools that were limited to necessary patents, because they presented less risk of industry-wide collusion."). "Essential" in this sense is typically taken to mean reasonably necessary to practice the standard in question. "Stated another way, there must be some reasonable expectation that a license is needed to implement the standard." *Rambus, 318 F.3d at 1101* ("To hold otherwise would . . . render the [SSO] disclosure duty unbounded. Under such an amorphous duty, any patent or application having a vague relationship to the standard would have to be disclosed."). *Id.* Of course, a broader set of IP rights than those necessary to practice the standard may properly be deemed essential in the economic sense. Virtually any IP that offers its users a competitive advantage can, *ceteris paribus*, conceivably drive an otherwise equally efficient firm from the market. That is a consequence of one of the features of an effectively competitive market that is most beneficial to the general welfare--the fact that in such a market a firm that is inefficient to any significant

degree cannot expect to survive. In that sense, we might consider essential any new product or process that gives its exclusive user a competitive advantage over firms that are otherwise equally efficient. On this view, only IP whose competitive advantage is demonstrably immaterial can reasonably be considered inessential. One must remain at least a bit concerned, however, about the potential sweep of such a conclusion. It seems to suggest that nonaccess to any (even minimally valuable) IP could be deemed anticompetitive (although we are addressing here nothing more than the scope of SSO disclosure and RAND licensing obligations, and certainly are not construing these cases to fall under the "essential facilities" doctrine). Antitrust law generally does not take note of efforts to seize or retain small advantages out of concern over administrability, if nothing else. Such administrability concerns would be apt here. For example, as the Federal Circuit has noted, under a more inclusive approach, "any patent or application having a vague relationship to the standard" might well be covered. One would worry much more about collusion than possible small imbalances if mere participation in an SSO were held to entail mandatory disclosure and licensing obligations for all such IP. That is, instead of one or two essential patents, the whole thicket of scores or hundreds of IP rights could be put in play in an environment lacking some or many of the safeguards against collusive spillovers that the DOJ, FTC, and the courts generally require when competitors gather together.

The optimal balance between these conflicting concerns in disclosure policy design--promoting the legitimate interests of standard setting and preserving competitive incentives for innovation--is a subject beyond the scope of this article. We have seen no persuasive argument, however, for imposing any duty that extends beyond essential patents and copyrights (and public patent applications that would yield essential patents). In any event, when disclosure duties are no broader than this, we believe it is clear that every SSO participant, whether or not it makes a compliant disclosure, should be subject to RAND licensing obligations. n137 As Lemley has observed, "nondisclosure is a successful anticompetitive strategy only if the IP owner can use its IP rights to hold up users of the standard." n138 This option is (or should be) unavailable to a licensor who is obligated to license essential IP on RAND terms--so long as a holder of undisclosed IP cannot shed its RAND obligations merely by resigning from an SSO after having sought to influence a standard-selection process that has formally commenced. n139 This can be seen by comparing the effects of nondisclosure when IP holders are and are not constrained by the RAND obligations we recommend in this article.

n137 Lemley, *supra* note 7, at 1961-62 (noting that "a licensing obligation should apply to IP whether or not it is disclosed").

n138 *Id.* at 1961.

n139 *Cf. Rambus, 318 F.3d at 1105* (examining issue of whether implicit disclosure duty underlying fraud verdict arose before party's withdrawal from SSO, and concluding that "the disclosure duty, as defined by the [SSO] policy, did not arise before legitimate proposals were directed to and formal consideration began on the . . . standard"), *cert. denied, 540 U.S. 874 (2003)*. We do assume that an IP owner has the option of disclaiming any RAND obligations in the SSO process by means of an express public declaration regarding specific patent, copyright, or other IP rights, *see supra* note 49, but we would not expect such a maneuver to be legally effective with regard to undisclosed rights.

Imagine a firm, X, that joins a standard-setting organization, and participates in some of its deliberations. X withholds from other participating enterprises the fact that it holds a patent application that, if granted, will be essential if a standard, S, is adopted. X succeeds in persuading the others to adopt standard S, even though there are alternatives that rely on readily available alternative technologies. First, assume that the SSO imposes no RAND obligations on its members. After the patent issues and other firms have made the investments required to adhere to the standard, X can proceed to exercise monopoly power that the standard, S, has bestowed on its IP. In these circumstances, intentional failure to disclose may well amount to an antitrust violation. n140 But the need for antitrust intervention may evaporate if instead the would-be monopolist is bound by a suitably-applied RAND obligation (as discussed directly below). In such a case, it will lack the ability to charge royalties that reflect market power created by standard selection or

investments others have made to follow the standard. It also will lack the ability to discriminate against other users of its IP.

n140 See Lemley, *supra* note 7, at 1927-35 (discussing requirements for antitrust liability in connection with failure to disclose IP in a standard-setting context). This has been the theory of several FTC enforcement actions. See *Dell Computer Corp.*, 121 F.T.C. 616 (1996); Rambus, Inc., FTC Docket No. 9302 (issued June 18, 2002) (complaint); Union Oil Co. of Cal., FTC Docket No. 9305 (issued Mar. 4, 2003) (complaint); M. Sean Royall, *The Role of Antitrust in Policing Unilateral Abuses of Standard-Setting Processes*, ANTITRUST, Spring 2004, at 44-49. Notably, in none of these cases were participants in the standard-setting process subject to RAND obligations.

The application of the RAND obligation to undisclosed IP held by participants in a standard-setting process is (we believe) reasonably straightforward even though the process cannot yield an "auction bid" for the undisclosed IP. If delay and the process of choosing a new standard were costless, the optimal policy would be to revoke the standard and reopen the process for a new selection. When this is too costly to be feasible (as will presumably often be the case), we propose that the RAND royalty for an undisclosed IP right be set at the incremental cost of licensing. n141 Of course, the royalty also should satisfy ECPR when the licensor competes downstream. n142

n141 Of course, the acceptably pertinent cost of licensing can legitimately include development expenses, particularly where the intellectual property elicits continuing sunk investment in R&D as further improvement in the IP remains possible. It should also probably include any other costs of innovation entailed in technology proposed for the standard-selection process, at least to the extent those outlays were not fully sunk before selection.

n142 Of course, this does not mean that the licensor would be permitted to use ECPR to obtain a *higher* royalty. Rather, ECPR would preclude the licensor from effectively charging itself a license fee below incremental cost.

Our approach ensures that, consistent with RAND principles, the IP holder does not command greater royalties than would have ensued in the event of full disclosure. Of course, this objective would also be achieved by capping the appropriate royalty at zero in cases of nondisclosure. Such a policy would risk being counterproductive, however, for at least two reasons. First, because efficient technology transfer often will entail recurring licensing costs, a zero-royalty policy might lead to opportunistic and inefficient efforts by an uncompensated IP owner to stint on its licensing obligations. Second, a zero-royalty policy might arguably amount to an excessive penalty that (at least with regard to unintentional failures to disclose) could appreciably reduce incentives to innovate.

Our proposed approach also provides disincentives to strategic nondisclosure that yields inefficient standards (i.e., standards that differ from the ones that would ensue through full disclosure). To see this, consider a hypothetical standard selection process where technology A, in which an SSO participant holds IP rights, is competing for selection with several known IP-protected, royalty-bearing technologies (B, C, D, etc.). First, in the case where A is materially superior to available alternatives, selection is already guaranteed. Nondisclosure may cement selection (as no alternative technologies can compete when the best is royalty-free) but will not avoid RAND obligations and will (under our proposed policy) serve to deprive the IP holder of considerable returns in excess of the incremental cost of licensing to which, with disclosure, its superiority would have entitled it. Second, in the case where A is materially inferior to available alternatives, although there may be theoretical incentives for nondisclosure, the likelihood of selection remains low to nil (as discussed in Part IV, *supra*). Only in the special case where the difference in value between A and all other options is less than the incremental cost of licensing will A be chosen (because no other option will be able to compete). Under our proposed policy, this will again yield a royalty (on A) just equal to the cost of licensing, which offers no profits (hence no incentives) for a strategy of nondisclosure.

The same is true in the case where all technologies are reasonably interchangeable and none is materially superior or inferior. In the presence of full disclosure, and given the absence of material differences in value between the best and the next-best alternatives, we would expect competition for selection to drive the royalty rate for whichever technology is selected toward a lower bound defined by the incremental cost of licensing. n143 Nondisclosure tilts the field toward A, which appears to be royalty-free. Competing technologies might even withdraw from the standard-selection process if their incremental licensing costs would exceed the small or nominal royalties they could expect in competition with A. Under our proposed policy, however, the post-disclosure RAND royalty for A will again be limited to the incremental cost of licensing and will yield no profits.

n143 We are assuming that the costs of innovation in developing the technologies in question have already been sunk.

In sum, we believe that nondisclosure by standard-setting participants can be largely dealt with through the RAND obligation itself. As suggested above, nondisclosure of IP rights in a given technology can be dealt with by requiring the licensing of those rights at the incremental cost of licensing.

VI. CONCLUDING OBSERVATIONS

Our central conclusion in this article is that in a broad class of circumstances the self-interest of the participants in a standard-setting process may be relied upon to induce the adoption of appropriate safeguards that can preclude the acquisition and exercise of monopoly power by those who hold IP rights in the selected standard. This generally will be possible as long as: competition at the pre-selection stage is effective and is facilitated by the creation of auction-like selection conditions; reasonable (though not necessarily complete or perfect) information is available to those involved in the selection process; and participants are effectively bound by the commitment to license on RAND terms.

As we have explained, a RAND licensing commitment has two elements: RAND license terms must be reasonable *and* nondiscriminatory. Only rules that deal effectively with both issues yield results that are unequivocally defensible as appropriate public policy. We have suggested that a royalty be deemed "reasonable" for RAND purposes when it is or approximates the outcome of an auction-like process appropriately designed to take lawful advantage of the state of competition existing *ex ante* (i.e., in advance of standard selection) between and among available IP options. We have suggested that a royalty be deemed "nondiscriminatory" for RAND purposes when it satisfies ECPR conditions, which ensure that it is competitively neutral and offers no special advantages to any competitor in the final product market, *including the IP owner itself*.

We would hope that the operation of and interplay between these two approaches would be reasonably apparent based on the discussion developed in the body of this article. As we have explained, theory teaches that the two methods normally yield the same results, which is hardly surprising given that the *ex ante* auction approach is in effect a practical technique for identifying "reasonable" royalties, rather than an independent source of economic principles distinct from those embodied in the ECPR formulas. In practice, of course, only one or the other approach may be useably available in a given situation. For example, even when *ex ante* competition is strong, an SSO may fail to capitalize effectively on it, with the result that there may be no precise or administrable limits on reasonableness in the first instance. When an SSO takes no steps at all to structure that process to facilitate effective *ex ante* competition and generate competitive "reasonable" royalty data, some might question (at least when there has been no fraud or misrepresentation in the process) whether there is a policy rationale for depriving the IP holder of the return to innovation accruing to the bottleneck monopoly power that market participants have essentially thrust upon it by failing to take practicable measures to constrain supracompetitive pricing. n144 Yet ECPR is potentially helpful in the event the choice is made to try to determine the competitive "reasonable" royalty level. Recall that the "reasonable" royalty is equal to the ECPR level calculated by reference to the competitive final product price $P[f,i]^*$ (assuming that downstream producers are equally efficient). If a reliable estimate of the latter price is available from the period before standard selection and if the necessary incremental cost data are on hand, then ECPR can supply the appropriate royalty calculation. In any event,

even if the IP holder is permitted to retain bottleneck market power, ECPR has a prophylactic role to play in guarding against the discriminatory exercise of that power.

n144 *Cf. United States v. Aluminum Co. of Am.*, 148 F.2d 416, 429 (2d Cir. 1945) (no violation of the Sherman Act when "monopoly may have been thrust upon" the defendant).

Finally, throughout this article we have assumed that RAND commitments are "binding" obligations (subject to certain specified exceptions) without identifying the institutional means or machinery by which they are actually enforced. Enforcement options include SSO self-regulation, common law contract and fraud remedies, copyright and patent litigation, as well as public and private (treble damage) antitrust proceedings. Choosing among these options is a topic that calls for a separate and thorough analysis. One ought not presume, however, that antitrust intervention is necessarily more nimble or sure-footed than other (less intrusive) legal or private remedies. n145 This article demonstrates how privately imposed RAND obligations, properly interpreted, can further antitrust objectives, such as constraining the creation of market power through standard setting and discrimination that forecloses efficient competitors.

n145 Antitrust enforcement must always proceed with particular caution when touching on the intellectual property system in light of the acknowledged importance of innovation to the U.S. (and world) economy. *See* James E. Rogan, Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office Prepared Remarks at the FTC/DOJ Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy, at the Hearings on Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy, Washington, D.C. (Feb. 6, 2002), *available at* <http://www.ftc.gov/opp/intellect/rogan.htm>), and in view of the need to avoid adopting or applying antitrust rules in a manner that unduly chills the creation and exercise of the legitimate rights bestowed by the patent, copyright and other intellectual property laws.